2.0 DESCRIPTION OF THE PROPOSED ACTION

2.1 PROPOSED FACILITIES

Northwest proposes to modify its existing natural gas transmission pipeline system between Sumas and Washougal, Washington. The Capacity Replacement Project would involve the construction and operation of pipeline loops and appurtenant facilities, modifications at existing compressor stations, and activities to abandon existing facilities as described below. An overview map of the project location and facilities is provided on figure 2.1-1. Detailed maps showing the pipeline loops, aboveground facilities, and pipe storage and contractor yards are contained in Appendix B.

2.1.1 Pipeline Facilities

Northwest's existing natural gas transmission system between Sumas and Washougal, Washington consists of two parallel 268-mile-long, 26-inch- and 30-inch-diameter pipelines and 27.8 miles of 36-inch-diameter pipeline in four separate loops adjacent to the 30-inch-diameter pipeline. The existing 36-inch-diameter loops were recently installed for Northwest's Evergreen Expansion Project (Docket No. CP02-04-000). The proposed pipeline facilities would consist of a total of 79.5 miles of new 36-inch-diameter pipeline in four separate loops in Whatcom, Skagit, Snohomish, King, Pierce, and Thurston Counties, Washington. The loops would be primarily adjacent to Northwest's existing 30-inch-diameter pipeline. After the new loops are installed, Northwest would abandon its existing 268-mile-long, 26-inch-diameter pipeline. The majority of the 26-inch-diameter pipeline would be abandoned in place; however, in some locations the pipeline would be removed (see section 2.2.1). Table 2.1.1-1 lists the proposed loops by name, milepost range, length, and county.

The MAOP of the proposed loops would be 960 psig, which is the MAOP of Northwest's existing system. Operating pressure on the existing 30-inch-diameter pipeline would not increase. Additional details of the pipeline design specifications are presented in section 4.12.1.

TABLE 2.1.1-1

Pipeline Facilities Associated with the Capacity Replacement Project

Facility	Milepost Range	Length (miles) [a]	County
Sumas Loop	1484.5 - 1461.8	22.7	Whatcom
Mount Vernon Loop	1431.3 - 1431.1	0.2	Skagit
	1431.1 - 1408.8	22.3	Snohomish [b]
		22.5	
Snohomish Loop	1393.9 - 1393.1	0.8	Snohomish
	1393.1 - 1382.0	11.1	King [c]
		11.9	
Fort Lewis Loop	1338.1 - 1324.3	13.7	Pierce
	1324.3 - 1315.6	8.7	Thurston
		22.4	
Project Total		79.5	

[a] Due to rounding, differences between mileposts may not equal the length.

[b] Within Snohomish County, the Mount Vernon Loop would cross land under the jurisdiction of the City of Lake Stevens at MP 1411.2 and between MPs 1410.0 and 1409.8.

[c] Within King County, the Snohomish Loop would cross land under the jurisdiction of the City of Redmond between MPs 1388.8 and 1387.4 and the City of Sammamish between MPs 1383.4 and 1382.0.

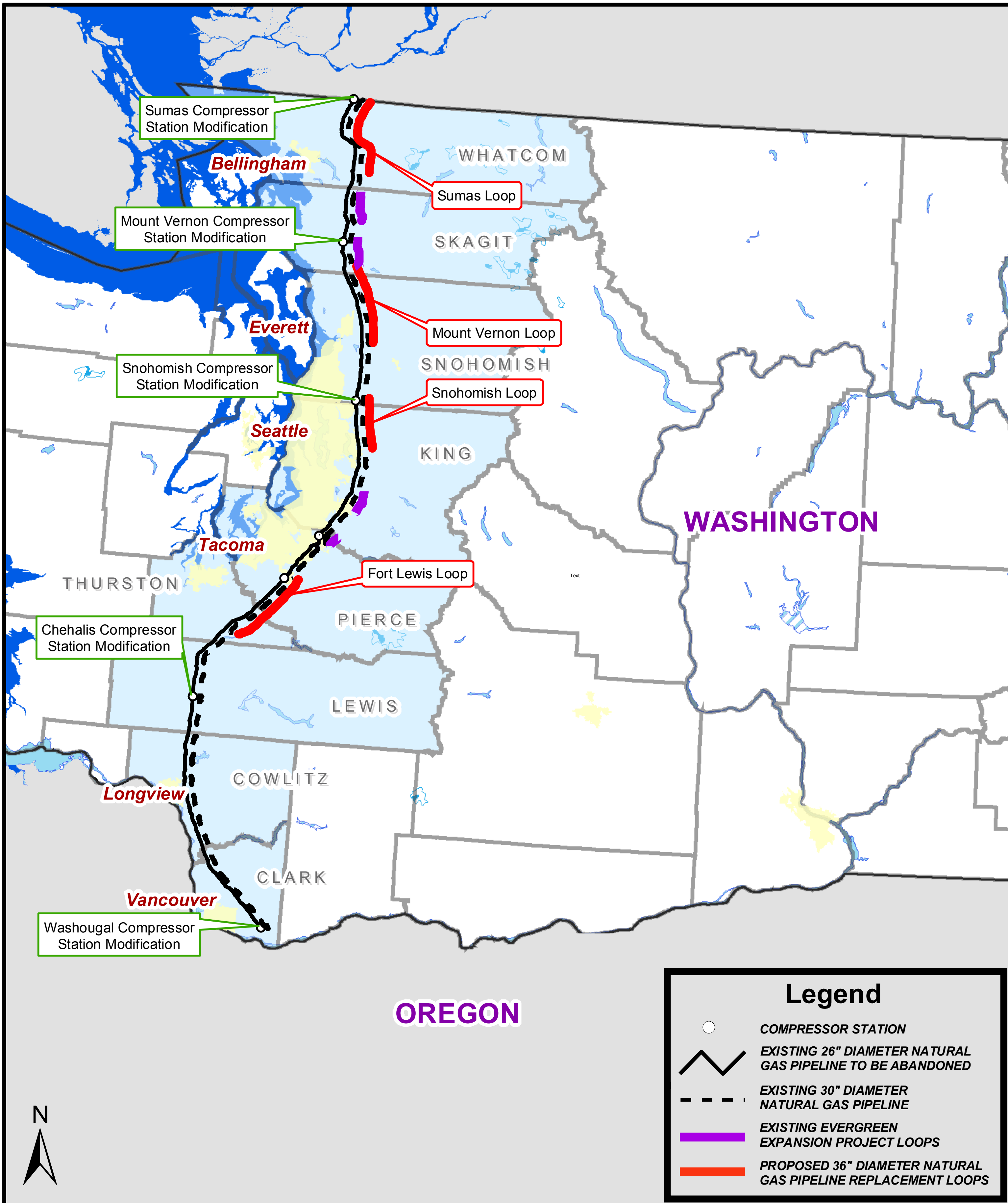


Figure 2.1-1

Capacity Replacement Project

Project Overview Map

2.1.2 Aboveground Facilities

Associated aboveground facilities proposed by Northwest include (see tables 2.1.2-1 and 2.1.2-2):

- modifications at 5 existing compressor stations, 1 each in Whatcom, Skagit, Snohomish, Lewis, and Clark Counties for a total of 10,760 net hp of new compression;
- installation of 3 pig launchers, 1 each at the beginning of the Sumas, Snohomish, and Fort Lewis Loops and collocated with proposed MLV sites;
- installation of 3 pig receivers, 1 each at the end of the Sumas, Snohomish, and Fort Lewis Loops and collocated with proposed MLV sites;
- relocation of 1 pig receiver from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop to the end of the proposed Mount Vernon Loop and collocated with a proposed MLV site;
- installation of 5 30-inch and 15 36-inch MLVs along the proposed loops (15 collocated with existing aboveground facilities, 4 collocated with proposed pig receiver sites, and 1 not collocated with other aboveground facilities); and
- installation of 6 30-inch MLVs along the existing Evergreen Expansion Project loops (all collocated with existing aboveground facilities).

Details of the aboveground facility design specifications and technical capabilities are presented in section 4.12.1.

TABLE 2.1.2-1

Compressor Station Modifications Associated with the Capacity Replacement Project

Facility	Modification	Existing Horsepower (ISO)	New/Uprated Horsepower (ISO)	Total Added Horsepower (ISO)	Milepost	County
Sumas Compressor Station	Reconfigure existing reciprocating compressors, modify piping, replace exhaust ducting and silencers	NA	NA	0	1484.5	Whatcom
Mount Vernon Compressor Station	Modify piping, replace exhaust ducting and silencers	NA	NA	0	1440.2	Skagit
Snohomish Compressor Station	Modify piping	NA	NA	0	1393.9	Snohomish
Chehalis Compressor Station	Install new Solar Taurus 70 compressor with a gas after cooler and fuel gas heater	NA	10,310	10,310	1289.4	Lewis
	Derate existing reciprocating compressor	6,350	4,800	-1,550		
	Remove Solar Saturn T1300 compressor from the station's operating permit	NA	NA	0		
	Modify piping	NA	NA	0		
Washougal Compressor Station	Uprate existing Solar Centaur 50 compressor to a Solar Taurus 60 compressor	5,700	7,700	2,000	1216.2	Clark
	Rewheel existing Solar C337 compressor	NA	NA	0		
Total Net Horsepower				10,760		

ISO = International Organization for Standardization.
NA = Not applicable.

TABLE 2.1.2-2

Pig Launcher/Receiver Facilities and Mainline Valves Associated with the Capacity Replacement Project

Loop/Aboveground Facility	Milepost	County
PIG LAUNCHERS/RECEIVERS		
Sumas		
Launcher	1484.5	Whatcom
Receiver [a]	1461.8	Whatcom
Mount Vernon		
Receiver [a, b]	1408.8	Snohomish
Snohomish		
Launcher	1393.9	Snohomish
Receiver	1382.0	King
Fort Lewis		
Launcher	1338.1	Pierce
Receiver	1315.6	Thurston
MAINLINE VALVES ALONG THE PROPOSED LOOPS [c]		
Sumas		
MLV (36-inch)	1484.5	Whatcom
MLV (36-inch)	1472.3	Whatcom
MLV (36-inch) [a]	1467.9	Whatcom
MLVs (30-inch and 36-inch) [a]	1461.8	Whatcom
Mount Vernon		
MLVs (30-inch and 36-inch)	1431.3	Skagit
MLV (36-inch)	1427.6	Snohomish
MLV (36-inch)	1411.3	Snohomish
MLVs (30-inch and 36-inch) [a]	1408.8	Snohomish
Snohomish		
MLV (36-inch)	1393.9	Snohomish
MLV (36-inch)	1387.5	King
MLV (36-inch)	1382.0	King
Fort Lewis		
MLVs (30-inch and 36-inch)	1338.1	Pierce
MLV (36-inch)	1335.1	Pierce
MLV (36-inch)	1324.7	Pierce
MLVs (30-inch and 36-inch)	1315.6	Thurston
MAINLINE VALVES ALONG THE EVERGREEN EXPANSION PROJECT LOOPS [c]		
Evergreen Sedro-Woolley		
MLV (30-inch)	1453.5	Skagit
Evergreen Mount Vernon		
MLV (30-inch)	1440.1	Skagit
Evergreen Covington		
MLV (30-inch)	1370.8	King
MLV (30-inch)	1364.0	King
Evergreen Auburn		
MLV (30-inch)	1355.2	King
MLV (30-inch)	1351.7	Pierce

[a] Not collocated with other existing aboveground facilities.

[b] Relocated from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop.

[c] The proposed 30-inch MLVs are necessary to isolate one pipeline during maintenance on the other parallel pipeline. This redundancy was previously provided by the 26-inch-diameter pipeline that would be abandoned.

2.1.3 Abandoned Facilities

After the proposed loops are placed in service, the 26-inch-diameter pipeline between Sumas and Washougal would be abandoned with the exception of a short segment within and between the existing Jackson Prairie Meter Station and the Chehalis Compressor Station. In order to abandon the 26-inch-diameter pipeline, Northwest would need to isolate it from other system components to prevent the potential for gas flow from the 26-inch-diameter pipeline to a meter station, or from the existing 30-inch-diameter pipeline and existing and proposed 36-inch-diameter loops into the abandoned 26-inch-diameter pipeline. The taps that feed the existing meter stations would be excavated and the valve isolated using a blind flange and welded cap. In addition, Northwest would excavate, cut, and cap the crossovers that currently tie the 26-inch-diameter pipeline to the 30-inch-diameter pipeline. The abandonment activities would occur at 24 locations along the proposed loops and at 48 other locations along the remainder of Northwest's existing system. Table 2.1.3-1 lists and describes the abandonment activities by facility name, milepost, and county.

Once the abandonment activities are completed, natural gas would be removed from the 26-inch-diameter pipeline and other facilities with nitrogen, an inert gas. Nitrogen would be allowed to flow into and continue down sections of the pipeline to displace all of the natural gas within that section. The facilities would then be isolated with the nitrogen in them, which would inhibit internal corrosion, and abandoned in place. No water would be used or discharged during purging activities. Northwest would maintain cathodic protection on the 26-inch-diameter pipeline after it is taken out of service to protect against corrosion and ensure that the pipeline would not rust and fail.

2.2 LAND REQUIREMENTS

Table 2.2-1 summarizes the land requirements for the Capacity Replacement Project. A detailed description and breakdown of land requirements and use is presented in section 4.8.1. Construction of the Capacity Replacement Project would disturb approximately 1,238.5 acres of land, including the pipeline facilities, aboveground facility sites, abandoned facility sites, and pipe storage and contractor yards. Approximately 706.1 acres of the 1,238.5 acres used for construction would be required for operation of the project. Of this total, about 704.6 acres would be for the pipeline facilities and 1.5 acres would be for the aboveground facilities. The remaining 532.4 acres of land would be restored and allowed to revert to former use.

Approximately 13 percent of the land affected by construction and operation of the Capacity Replacement Project would be on federal lands associated with Fort Lewis (6 percent) and tribal lands (1 percent), the State of Washington (2 percent), and local governments (4 percent). The remainder of the land that would be affected (87 percent) is privately owned. A detailed description of land ownership is presented in section 4.8.2.

2.2.1 Pipeline Facilities

Of the approximately 1,238.5 acres of land disturbed during construction of the Capacity Replacement Project, about 877.0 acres would be disturbed by the pipeline right-of-way, 144.1 acres would be disturbed by temporary extra workspace, and 3.0 acres would be disturbed by access roads. Of the 877.0 acres disturbed by the pipeline construction right-of-way, about 687.6 acres or 78 percent is currently maintained as part of Northwest's existing permanent right-of-way. Operation of the pipeline facilities would require about 704.6 acres of land, consisting of 704.3 acres for the pipeline right-of-way and 0.3 acre for permanent access roads along the pipeline right-of-way.

TABLE 2.1.3-1

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
ABANDONMENT ACTIVITIES ALONG THE PROPOSED LOOPS		
Whatcom		
Sumas Loop		
Bellingham No. 2 Delivery Meter Station	1481.6	Install 12-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Lynden Delivery Meter Station	1478.6	Install 3-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Lawrence Delivery Meter Station	1473.5	Install 2-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Bellingham Line Interconnect	1472.3	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
6-inch Bellingham Line	1472.3	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Deming Delivery Meter Station	1469.9	Install 2-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
26-inch Crossover	1468.1	Disconnect the crossover between the 26-inch- and 30-inch-diameter pipelines; install new crossover between the 30-inch- and 36-inch-diameter pipelines.
Snohomish		
Mount Vernon Loop		
Stanwood Line	1429.8	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
26-inch Crossover	1427.6	Disconnect the crossover between the 26-inch- and 30-inch-diameter pipelines; install new crossover between the 30-inch- and 36-inch-diameter pipelines.
Latter Day Saint Delivery Tap	1424.0	Isolate from the 26-inch-diameter pipeline.
Arlington Delivery Meter Station	1422.6	Install 3-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Granite Falls Delivery Meter Station	1414.1	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Lake Stevens Delivery Meter Station	1409.8	Install 3-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Snohomish		
Snohomish Loop		
Echo Lake Meter Station	1394.0	Blind 1-inch tap valve and cap line at the 26-inch-diameter pipeline; isolate the 26-inch-diameter pipeline from the 30-inch crossover.
King		
Snohomish Loop		
Duvall-Cottage Lake Delivery Meter Station (Abandoned)	1391.4	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Novelty Hill Delivery Meter Station	1387.2	Install 8-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Redmond Delivery Meter Station	1385.4	Install 6-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.

TABLE 2.1.3-1 (cont'd)

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
Redmond District Delivery Tap (Abandoned)	1383.9	Install 2-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Pierce		
Fort Lewis Loop		
Frederickson and Puget Power Delivery Meter Station	1338.1	Install 10-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Bethel Delivery Meter Station	1335.8	Install 4-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
26-inch Crossover, Valve 16-7AX-A,B (16-inch-diameter pipeline) 26-inch Crossover, Valve 16-7AX (26-inch-diameter pipeline)	1335.1	Disconnect the crossover between the 26-inch- and 30-inch-diameter pipelines; install new crossover between the 30-inch- and 36-inch-diameter pipelines.
16-inch Crossover	1324.7	Disconnect and reconnect crossover.
Thurston		
Fort Lewis Loop		
Yelm Delivery Meter Station	1322.9	Install 4-inch tap on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
Olympia/Grays Harbor Lateral	1315.6	Install 16-inch and 10-inch taps on the 36-inch-diameter pipeline and isolate from the 26-inch-diameter pipeline.
ABANDONMENT ACTIVITIES IN LOCATIONS OUTSIDE THE PROPOSED LOOPS		
Whatcom		
Acme Meter Station	1461.2	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Skagit		
Fruitdale Block Valve	1450.7	Isolate from the 26-inch-diameter pipeline.
Sedro-Woolley Meter Station	1447.7	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline. Provide new connection to the 36-inch-diameter pipeline.
Anacortes Meter Station	1440.6	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Snohomish		
Machias Meter Station	1408.0	Blind 3-inch tap valve and cap line at the 26-inch-diameter pipeline.
Snohomish Meter Station	1402.5	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Grotto line Take-off	1401.0	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Bartelheimer Dairy Meter Station	1400.2	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
North Seattle Take-off	1397.1	Isolate both laterals from the 26-inch-diameter pipeline. Provide new connections to the 30-inch-diameter pipeline.
King		
North Bend Meter Station	1379.3	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
May Valley Meter Station	1372.7	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
South Seattle Take-off	1370.1	Blind both 10-inch tap valves and cap line at the 26-inch-diameter pipeline.
Lake Francis Meter Station	1368.6	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Covington Meter Station	1362.8	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.

TABLE 2.1.3-1 (cont'd)

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
Black Diamond Meter Station	1360.2	Blind 10-inch tap valve and cap line at the 26-inch-diameter pipeline.
Cameron Village East Auburn Tap	1356.1	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Enumclaw Buckley Meter Station	1356.0	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Pierce		
North Tacoma Take-off	1352.1	Isolate both 8-inch and 16-inch laterals from the 26-inch-diameter pipeline and make new connections to the 30-inch-diameter pipeline.
Sumner Compressor Station	1351.6	Piping modification.
Puyallup North Meter Station	1347.2	Blind 4-inch tap valve and cap line at the 26-inch-diameter pipeline.
Puyallup (Rainier Terrace) Meter Station	1343.3	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
South Tacoma Delivery Site	1339.2	Isolate from the 26-inch-diameter pipeline and tie-in blow-off valves.
Boeing and Fredrickson Delivery Meter	1338.9	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Scott Delivery Meter Station	1338.4	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Thurston		
26-inch Crossover, Valve 16-6XS	1309.9	Isolate valve from the 26-inch-diameter pipeline.
Lewis		
Centralia Line Take-off	1305.3	Isolate from the 30-inch-diameter interconnect.
Chehalis Meter Station	1298.2	Isolate from the 30-inch-diameter interconnect.
Berwick Lateral Tie-In	1297.2	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Mac Millan Rest Home Tap	1294.5	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Jackson Prairie Storage Facility	1289.3	Piping modification.
Winlock Meter Station	1286.8	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline. Verify the connection to the 30-inch-diameter pipeline.
Toledo Meter Station	1284.0	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Cowlitz		
Castle Rock Meter Station	1270.9	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline, remove 1-inch blow-off valve.
Kelso-Beaver Meter Station	1266.6	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Weyerhaeuser/Ostrander Meter Station	1265.5	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Kelso (Longview) Meter Station	1262.9	Blind 4-inch tap valves and cap two 4-inch-diameter lines at the 26-inch-diameter pipeline.
Longview South Meter Station	1258.4	Blind 6-inch tap valve and cap line at the 26-inch-diameter pipeline.
Kalama Farm Tap	1251.4	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Astoria Line Take-off	1249.3	Blind 12-inch tap valve and cap line at the 26-inch-diameter pipeline.
Woodland Meter Station	1243.7	Blind 4-inch tap valve and cap line at the 26-inch-diameter pipeline.

TABLE 2.1.3-1 (cont'd)

Abandonment Activities Associated with the Capacity Replacement Project

County/Facility	Milepost	Description of Activity
Clark		
Van Der Salm Bulb Farm Meter Station	1240.0	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline. Verify the connection to the 30-inch-diameter pipeline.
26-inch Crossover, Valve 16-1X	1239.4	Isolate valve from the 26-inch-diameter pipeline.
Ridgefield Meter Station	1237.7	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline.
Portland Lateral Take-Off	1232.5	Remove input from the 26-inch-diameter pipeline, blind both 16-inch tap valves, cap 16-inch lines, isolate bypass, and disconnect interconnect to the 30-inch-diameter line.
Battleground District Office Meter Tap	1231.1	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline
Battleground Meter Station	1229.1	Blind 2-inch tap valve and cap line at the 26-inch-diameter pipeline. Remove 1-inch vent.
North Vancouver Meter Station	1225.4	Blind 4-inch tap valve and cap line at the 26-inch-diameter pipeline. Remove 2-inch vent. Install isolation flange.
Camas Delivery Meter Station	1217.5	Isolate two 4-inch lines from the 26-inch-diameter pipeline. Install 4-inch blind flange on each tap. Cap each 4-inch pipeline connection. Maintain single 4-inch connection to the 30-inch-diameter pipeline.

TABLE 2.2-1

Summary of Land Requirements Associated with the Capacity Replacement Project

Facility	Land Affected During Construction (acres)	Land Affected During Operation (acres)
Pipeline Facilities		
Pipeline Right-of-Way		
Existing Permanent Easement	687.6	687.6
New Permanent Easement	16.7	16.7
Temporary Construction Right-of-Way	172.7	0.0
Pipeline Right-of-Way Subtotal	877.0	704.3
Temporary Extra Workspace	144.1	0.0
Access Roads	3.0	0.3
Pipeline Facilities Total	1,024.1	704.6
Aboveground Facilities		
Compressor Stations		
Sumas Compressor Station	0.0	0.0
Mount Vernon Compressor Station	0.0	0.0
Snohomish Compressor Station	0.0	0.0
Chehalis Compressor Station	7.7	1.5
Washougal Compressor Station	0.0	0.0
Compressor Station Subtotal	7.7	1.5
Pig Launchers and Receivers [a]	0.0	0.0
Mainline Valves		
Along the Proposed Loops [b]	0.0	0.0
Along the Evergreen Expansion Project Loops [c]	1.7	0.0
Mainline Valve Subtotal	1.7	0.0
Aboveground Facilities Total	9.4	1.5
Abandoned Facilities		
Along the Proposed Loops [d]	0.0	0.0
Along the Remainder of Northwest's System	14.4	0.0
Abandoned Facilities Total	14.4	0.0
Pipe Storage and Contractor Yards	190.6	0.0
Project Total	1,238.5	706.1

[a] The pig launcher at the beginning of the Sumas Loop (MP 1484.5) would be located within the existing Sumas Compressor Station and would not require any additional land during construction and operation. The other two pig launchers and two of the pig receivers would be collocated with other aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation. Construction of these facilities would require temporary extra workspace outside Northwest's existing right-of-way. The acreage of disturbance associated with the construction of these facilities is included in the acreage calculations for temporary extra workspace associated with the pipeline facilities. The two pig receivers not collocated with other aboveground facilities would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with these facilities is included in the acreage calculations for the pipeline facilities.

[b] All but one of the MLVs along the proposed loops would be collocated with either existing aboveground facilities or proposed pig receiver sites within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation. Construction of these facilities would require temporary extra workspace outside Northwest's existing right-of-way. The acreage of disturbance associated with the construction of these facilities is included in the acreage calculations for temporary extra workspace associated with the pipeline facilities. The one MLV not collocated with other aboveground facilities would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with this facility is included in the acreage calculations for the pipeline facilities.

[C] Of the six MLVs along the Evergreen Expansion Project loops, five would require about 0.3 acre each of land for construction and one would require about 0.2 acre of land for construction. All of these facilities would be collocated with existing aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation.

[d] The acreage of disturbance associated with the abandoned facilities along the proposed loops is included in the acreage calculations for the pipeline right-of-way.

The proposed loops would be generally installed within Northwest's existing permanent right-of-way using a standard 20-foot offset to the east of Northwest's existing 30-inch-diameter pipeline. At certain locations, however, the proposed route deviates from this standard offset configuration due to terrain, environmental features, or development. Table C-1 in Appendix C identifies the location and length of each non-standard parallel offset (including locations where the 26-inch-diameter pipeline would be removed and the 36-inch-diameter pipeline installed in the same trench) and route variations and provides Northwest's rationale for adopting them as part of the proposed route.

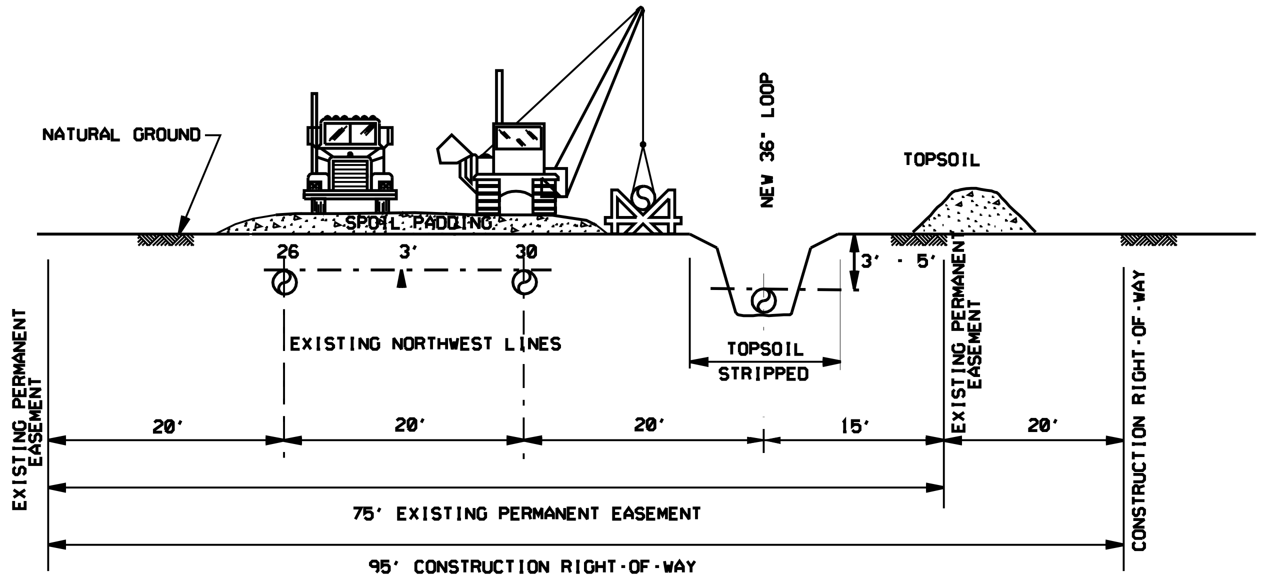
Of the 79.5 miles of proposed pipeline, approximately 78.4 miles (99 percent) would be constructed within or adjacent to Northwest's existing right-of-way and 1.1 miles (1 percent) would be constructed on newly created right-of-way that does not parallel existing rights-of-way. Of the 78.4 miles, 74.2 miles (93 percent of the total route) would be constructed within Northwest's existing right-of-way and would not require any additional permanent right-of-way for operation (51.6 miles using the standard 20-foot offset to the east of the existing 30-inch-diameter pipeline and 22.6 miles using a non-standard parallel offset). The remaining 4.2 miles (5 percent of the total route) would be located adjacent to and/or partially overlap Northwest's existing easement but would require additional permanent right-of-way for operation.

Northwest proposes to generally use a 95-foot-wide construction right-of-way, consisting of Northwest's existing 75-foot-wide maintained right-of-way and 20 feet of new temporary workspace. On the Snohomish Loop and in other areas where encroachment, development, or other limitations confine available workspace, Northwest would remove the 26-inch-diameter pipeline and place the 36-inch-diameter loop in the same trench using the full width of the existing right-of-way, which varies from 60 to 75 feet. In total, the 26-inch-diameter pipeline would be removed from about 14.6 miles along the proposed loops (11.9 miles along the Snohomish Loop, 1.8 miles along the Sumas Loop, 0.7 mile along the Mount Vernon Loop, and 0.2 mile along the Fort Lewis Loop). Northwest would generally use a 75-foot-wide construction right-of-way in wetland areas. In those areas where the proposed loop deviates from the existing right-of-way, Northwest would typically use a 95-foot-wide construction right-of-way. Figure 2.2.1-1, sheets 1 through 3, illustrates Northwest's typical right-of-way cross sections along the proposed loops. Northwest's actual breakdown of workspace within the construction right-of-way (e.g., spoil storage areas, equipment travel lanes) would vary depending on site-specific conditions.

Because the majority of the new loops would be installed within the existing 75-foot-wide right-of-way, no additional permanent right-of-way would be required. In some locations, Northwest retains only a 60-foot-wide permanent right-of-way. Northwest does not currently plan on purchasing additional permanent right-of-way in residential areas where the current easements are less than 75 feet. Northwest may, however, require additional permanent right-of-way to accommodate non-standard parallel offsets or crossovers of the existing pipelines to avoid terrain features or structures on or near the existing permanent right-of-way. In general, if the new 36-inch-diameter loop is closer than 10 feet to the edge of the current permanent right-of-way, Northwest has indicated that it may need to acquire additional permanent right-of-way. In those areas where the proposed loop deviates from the existing right-of-way, Northwest would typically retain a 50-foot-wide new permanent right-of-way.

In addition to the construction right-of-way, Northwest has identified temporary extra workspaces that would be required for staging areas and construction at wetlands, waterbodies, and roads, and in areas of steep slopes and rugged terrain. The approximate locations and sizes of temporary extra workspaces identified by Northwest are listed in table D-1 in Appendix D.

Working Side Over the Existing Lines



Working Side Not Over the Existing Lines

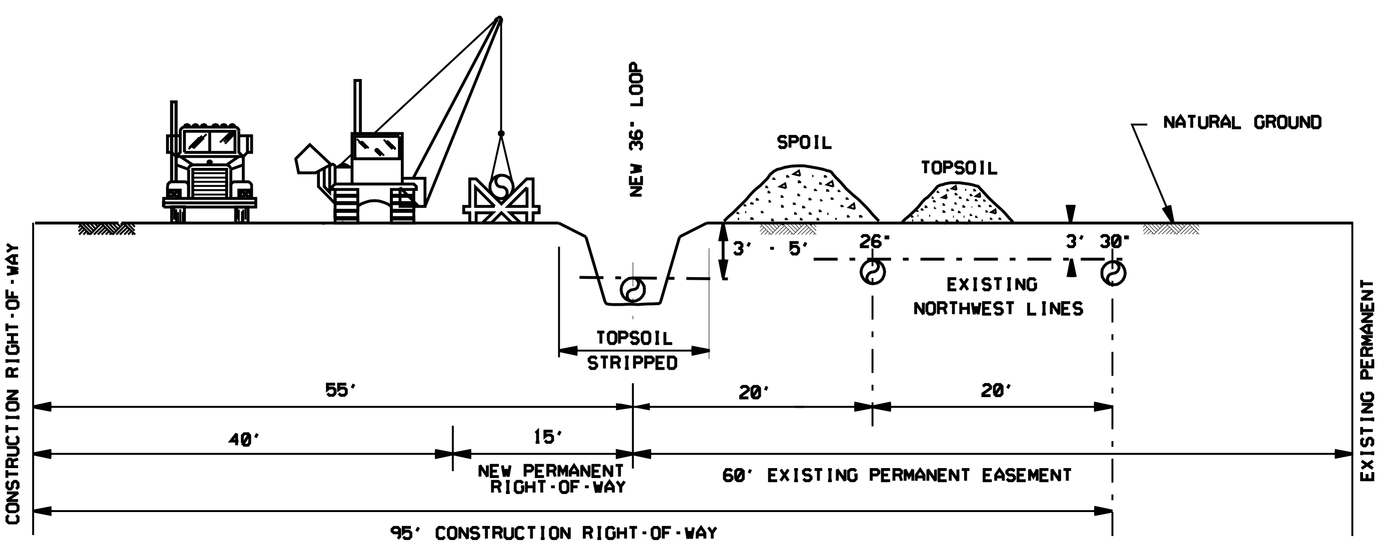
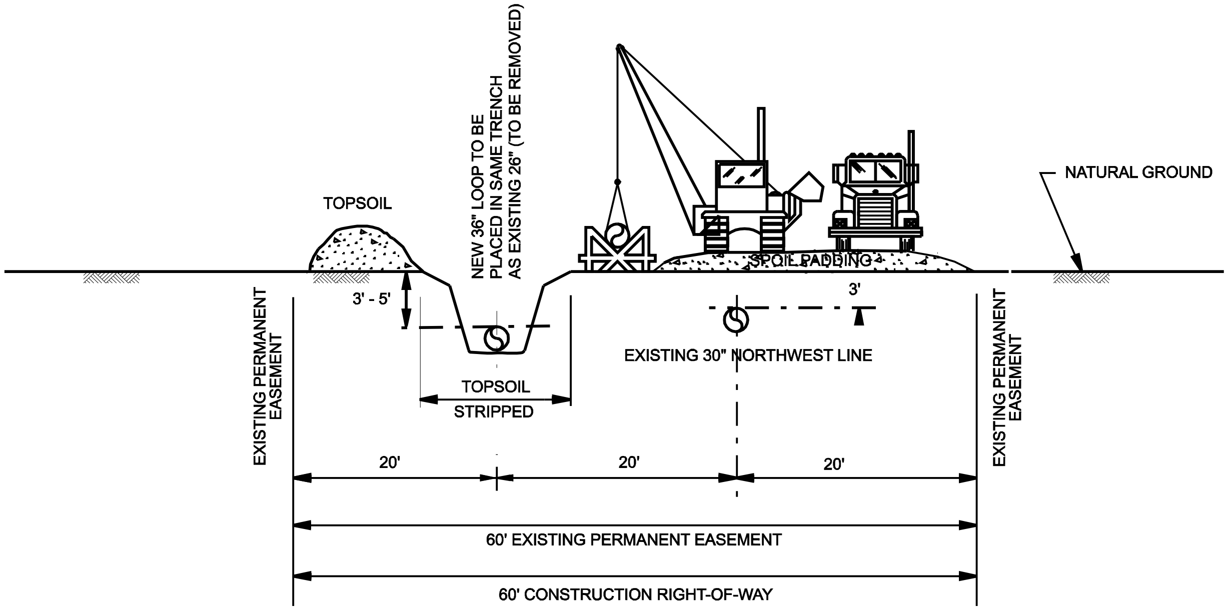


Figure 2.2.1-1

Capacity Replacement Project

Typical Right-of-Way Cross Sections

Same Trench Construction with 60-foot-wide Construction Right-of-Way



Same Trench Construction with 95-foot-wide Construction Right-of-Way

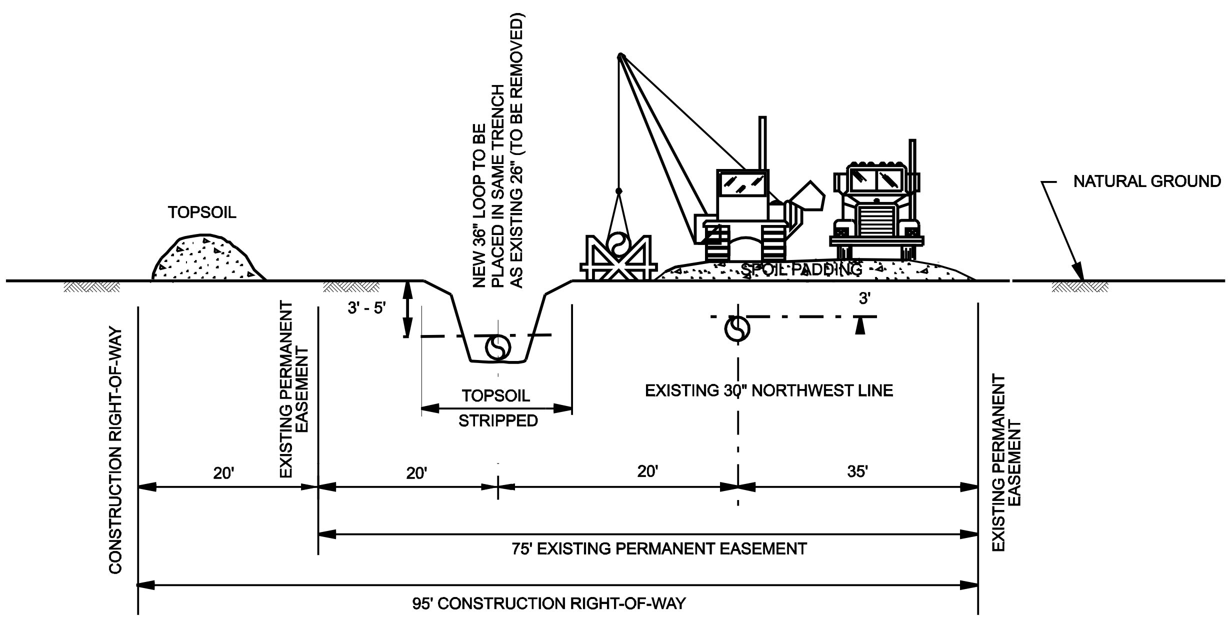
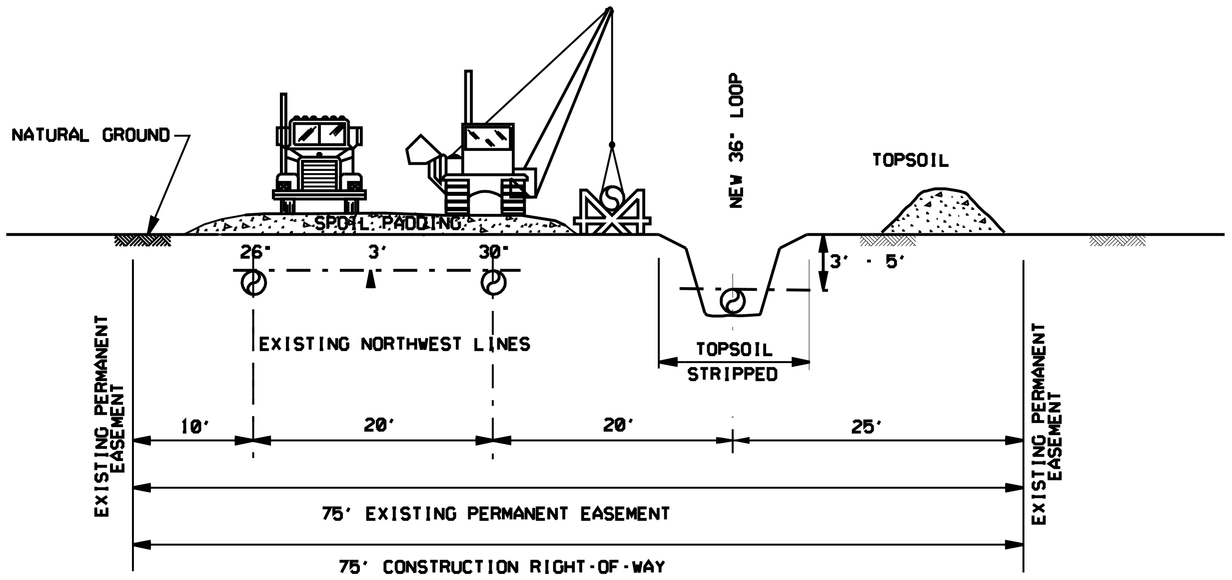


Figure 2.2.1-1

Capacity Replacement Project

Typical Right-of-Way Cross Sections

Non-Agricultural Wetlands



Route Variations

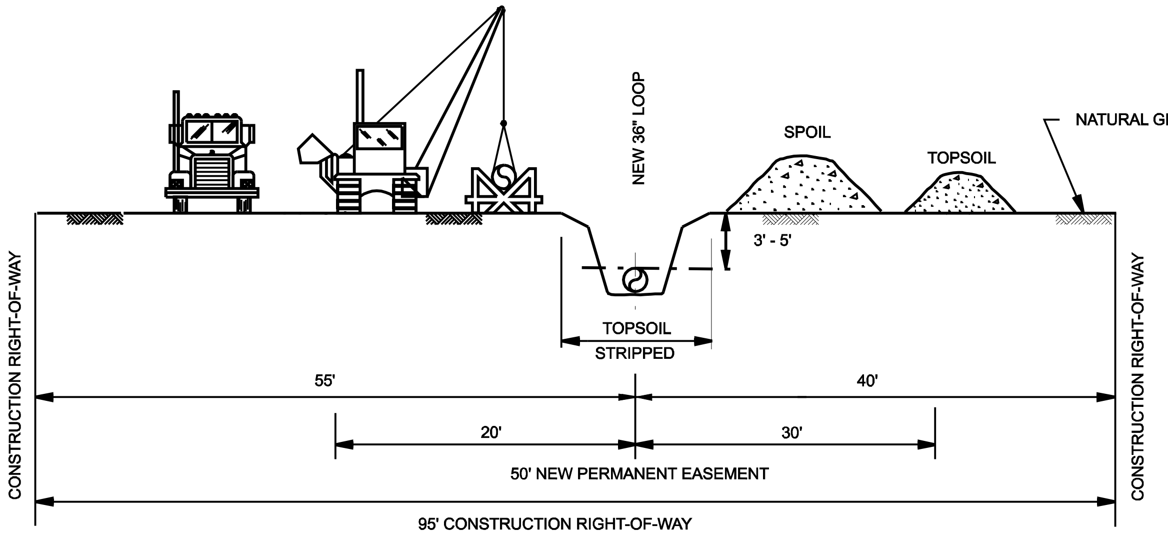


Figure 2.2.1-1

Capacity Replacement Project

Typical Right-of-Way Cross Sections

Northwest would utilize the same access roads that are currently used for operation of the existing easement to provide access to most of the construction right-of-way. Other roads recently constructed by public and private entities may also be used if they are suitable and landowner approval is received. Northwest indicates that the availability of existing public and private roads is sufficient to preclude the need to construct new roads to access the pipeline right-of-way; however, Northwest would need to construct nine temporary access roads along the construction right-of-way to avoid or minimize impacts on waterbodies and/or wetlands or to provide access to features in order to avoid major move-arounds of construction equipment. In addition, Northwest would construct two permanent access roads to provide operational access to two aboveground facility sites (see section 2.2.2). The locations of the identified access roads and proposed new access roads are listed in table D-2 in Appendix D.

The WDFW commented that some of the culverts carrying streams under the existing access roads that would be used would not be adequate to handle the weight of heavy construction equipment and loaded stringing trucks. Specifically, in some cases, the culverts carrying streams under these roads are old, are fish passage barriers, and/or have insufficient cover to prevent damage or collapse. In addition, there are some abandoned or plugged culverts within the right-of-way that should be removed and the stream channel restored. The WDFW recommended that the FERC require Northwest to upgrade all access road culverts to current WDFW fish passage criteria and remove all abandoned or plugged culverts encountered within the right-of-way and restore the stream channel. Northwest would conduct repairs that are necessary to ensure that access roads would support the load of heavy equipment during construction and would repair any roads or culverts it damages during construction. However, as part of the FERC's authority over the proposed project, the FERC does not believe it is appropriate to require Northwest to complete the upgrades, repairs, and/or removal of all of the culverts as recommended by the WDFW.

2.2.2 Aboveground Facilities

Northwest proposes to use a total of about 9.4 acres of land for construction of aboveground facilities. Of this total, 1.5 acres would be retained during operation. Construction activities at four of the five compressor stations (Sumas, Mount Vernon, Snohomish, and Washougal) would occur within the existing buildings or on previously disturbed, graded, or graveled areas within the existing fenceline of the facilities. No additional land would be required or disturbed during the modifications to these stations. A total of approximately 7.7 acres of land would be required for construction activities at the Chehalis Compressor Station. Of the 7.7 acres, 1.5 acres would be permanently added to the existing facility (1.4 acres to expand the station's fenced area and 0.1 acre for a gravel road to an existing water supply well).

Three pig launchers and four pig receivers would be constructed as part of the Capacity Replacement Project. The three pig launchers would be installed at the beginning of the Sumas, Snohomish, and Fort Lewis Loops. Three of the pig launchers would be installed at the end of each of these loops and one pig receiver would be relocated from its previous location on the existing Evergreen Expansion Project Mount Vernon Loop to the end of the proposed Mount Vernon Loop. The pig launcher at the beginning of the Sumas Loop (MP 1484.5) would be located within the existing Sumas Compressor Station and would not require any additional land during construction and operation. The other two pig launchers and two of the pig receivers would be collocated with other aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation. Construction of these facilities would require temporary extra workspace outside Northwest's existing right-of-way. The acreage of disturbance associated with the construction of these facilities is included in the acreage calculations for temporary extra workspace associated with the pipeline facilities. The two pig receivers not collocated with other aboveground facilities (MPs 1461.8

and 1408.8) would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with these facilities is included in the acreage calculations for the pipeline facilities.

A total of 26 MLVs (5 30-inch and 15 36-inch MLVs associated with the proposed loops and 6 30-inch MLVs along the existing Evergreen Expansion Project loops) would be constructed as part of the project. All but one of the MLVs along the proposed loops would be collocated with either existing aboveground facilities or the proposed pig receiver sites at MPs 1461.8 and 1408.8 within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation. Construction of these facilities would require temporary extra workspace outside Northwest's existing right-of-way. The acreage of disturbance associated with the construction of these facilities is included in the acreage calculations for temporary extra workspace associated with the pipeline facilities. The one MLV not collocated with other aboveground facilities (MP 1467.9) would be constructed within Northwest's existing right-of-way. The acreage of disturbance associated with this facility is included in the acreage calculations for the pipeline facilities. Of the six MLVs along the Evergreen Expansion Project loops, five would require about 0.3 acre each of land for construction and one would require about 0.2 acre of land for construction (1.7 acres total). All of these facilities would be collocated with existing aboveground facilities within Northwest's existing right-of-way and would not require any additional land outside the right-of-way during operation.

Northwest would construct two permanent access roads to provide operational access to the site of the pig receiver and two MLVs at the end of the Mount Vernon Loop at MP 1408.8 and the site of the pig receiver and two MLVs at the end of the Fort Lewis Loop at MP 1315.6. The access road to the site at MP 1408.8 would be about 266 feet long and would affect about 0.1 acre of land. The access road to the site at MP 1315.6 would be about 352 feet long and would affect about 0.2 acre of land.

2.2.3 Abandoned Facilities

The abandonment activities at the 24 locations along the proposed loops would occur within the construction right-of-way associated with each loop and would not require any additional land. Construction activities at the 48 abandoned facility sites located outside of the proposed loops would require about 14.4 acres of land within Northwest's existing permanent right-of-way. The locations and sizes of the temporary extra workspaces associated with these facilities are listed in table D-3 in Appendix D.

2.2.4 Pipe Storage and Contractor Yards

To support construction activities, Northwest proposes to use 13 pipe storage and contractor yards on a temporary basis. These yards would temporarily affect about 190.6 acres of land. The sizes and locations of the yards identified by Northwest are listed in table 2.2.4-1.

2.3 CONSTRUCTION PROCEDURES

The pipeline facilities would be designed, constructed, tested, and operated in accordance with all applicable requirements included in the DOT regulations in Title 49 CFR Part 192,[1] Transportation of Natural and Other Gas by Pipeline: Minimum Federal Safety Standards; and other applicable federal and state regulations, including U.S. Department of Labor, Occupational Safety and Health Administration (OSHA) requirements. These regulations are intended to ensure adequate protection for the public and to

[1] Pipe design regulations for steel pipe are contained in subpart C, Part 192. Section 192.105 contains a design formula for the pipeline's design pressure. Sections 192.107 through 192.115 contain the components of the design formula, including yield strength, wall thickness, design factor, longitudinal joint factor, and temperature derating factor, which are adjusted according to the project design conditions, such as pipe manufacturing specifications, steel specifications, class location, and operating conditions. Pipeline operating regulations are contained in subpart L, Part 192.

prevent natural gas pipeline accidents and failures. Among other design standards, Part 192 specifies pipeline material and qualification, minimum design requirements, and protection from internal, external, and atmospheric corrosion.

TABLE 2.2.4-1

Pipe Storage and Contractor Yards Associated with the Capacity Replacement Project

Facility	Size (acres)	Previously Disturbed	County	Section/Township/Range
Sumas Industrial Park Yard	6.0	Yes	Whatcom	Sec. 34, T41N, R4E
Jones Road Yard (Lots 1 and 2)	25.5	Yes [a]	Whatcom	Sec. 36, T41N, R4E
Bellingham GSX Yard				
Rail Siding	13.5	Yes	Whatcom	Sec. 8, 16, 17, 21, and 22, T40N, R1E
Staging Site	18.9	No		
Nooksack Yard	7.6	Yes	Whatcom	Sec. 29, T40N, R4E
Burlington Yard	14.8	Yes	Skagit	Sec. 29, T35N, R4E
Skagit Yard	4.5	Yes	Skagit	Sec. 24, T35N, R4E
Arlington Yard	16.4	Yes	Snohomish	Sec. 22, T31N, R5E
Second Arlington Yard	10.1	Yes	Snohomish	Sec. 14, T31N, R5E
Maltby 1a and 1b Yards	6.7	No	Snohomish	Sec. 24, T27N, R5E
Maltby 2a, 2b, and 2c Yards	9.7	No	Snohomish	Sec. 25, T27N, R5E
4647 – 192nd Yard	18.0	Yes	Pierce	Sec. 36, T19N, R3E
4667 – 192nd Yard	28.7	Yes	Pierce	Sec. 36, T19N, R3E
Yelm Yard	10.2	No	Thurston	Sec. 18 and 19, T17N, R2E
Total	190.6			

[a] The Jones Road Yard currently consists of plowed fields but has been used in the past by Northwest as a temporary construction work area so is considered previously disturbed.

To reduce construction impacts, Northwest would implement the January 17, 2003 versions of the FERC staff's Upland Erosion Control, Revegetation, and Maintenance Plan (Plan) and Wetland and Waterbody Construction and Mitigation Procedures (Procedures) (see Appendices E and F, respectively).[2] In some cases, variances to the Plan and Procedures have been requested. Variances are discussed in the following subsections and in section 4.0 as applicable. In addition to implementing the Plan and Procedures, Northwest has prepared a project-specific ECR Plan (see Appendix G) that incorporates many of the mitigation measures outlined in the Plan and Procedures as well as agency-recommended revegetation and erosion control procedures. Other jurisdictional agencies (e.g., land management and county agencies) may also require Northwest to prepare and implement plans specific to their jurisdictions.

The intent of the FERC staff's Plan and Procedures is to assist applicants by identifying baseline mitigation measures for minimizing the extent and duration of disturbances on soils, wetlands, and waterbodies associated with projects under the FERC's jurisdiction throughout the country. As general guidelines, the Plan and Procedures may be less stringent than state and local guidelines that are based on local concerns and issues. For example, buffer zone widths, revegetation monitoring, and mitigation scope are all more rigorous under Washington state guidelines due to the critical habitat areas located in the state. Recent guidelines from Washington state agencies (e.g., the WDOE's August 2001 Stormwater Management Manual for Western Washington, the WDOE's April 2004 Guidance on Wetland Mitigation in Washington State, and the WDFW's 2002 Integrated Streambank Protection Guidelines) are

[2] The FERC staff's Plan and Procedures are a set of construction and mitigation measures that were developed in collaboration with other federal and state agencies and the natural gas pipeline industry to minimize the potential environmental impacts of the construction of pipeline projects in general.

increasingly emphasizing holistic, site-specific solutions that utilize "best available science" all the way from planning through construction, especially for critical areas. The WDOE is the agency with jurisdiction for the section 401 Water Quality Certification that would be required for this project. It is expected that the WDOE would require that Northwest conform to state guidelines as a condition of permit approval. Other federal, state, and local agencies may impose additional requirements as part of their authorizations. Northwest would be required to adhere to the most stringent of its permit conditions during construction and operation of the Capacity Replacement Project.

To avoid or minimize the potential for harmful spills and leaks during construction, Northwest has developed a Spill Prevention, Containment, and Countermeasures Plan (SPCC Plan) (see Appendix H). Northwest's SPCC Plan describes spill prevention practices, emergency response procedures, emergency and personnel protection equipment, release notification procedures, and cleanup procedures.

Northwest has also prepared a Horizontal Directional Drill Contingency Plan (HDD Plan) (see Appendix I) for the proposed horizontal directional drill (HDD) crossings that identifies specific procedures and steps involved with pipeline installation as well as corrective actions and monitoring, cleanup, and agency notification procedures in the event of an inadvertent release of drilling fluid.

These plans are discussed in further detail in section 4.0.

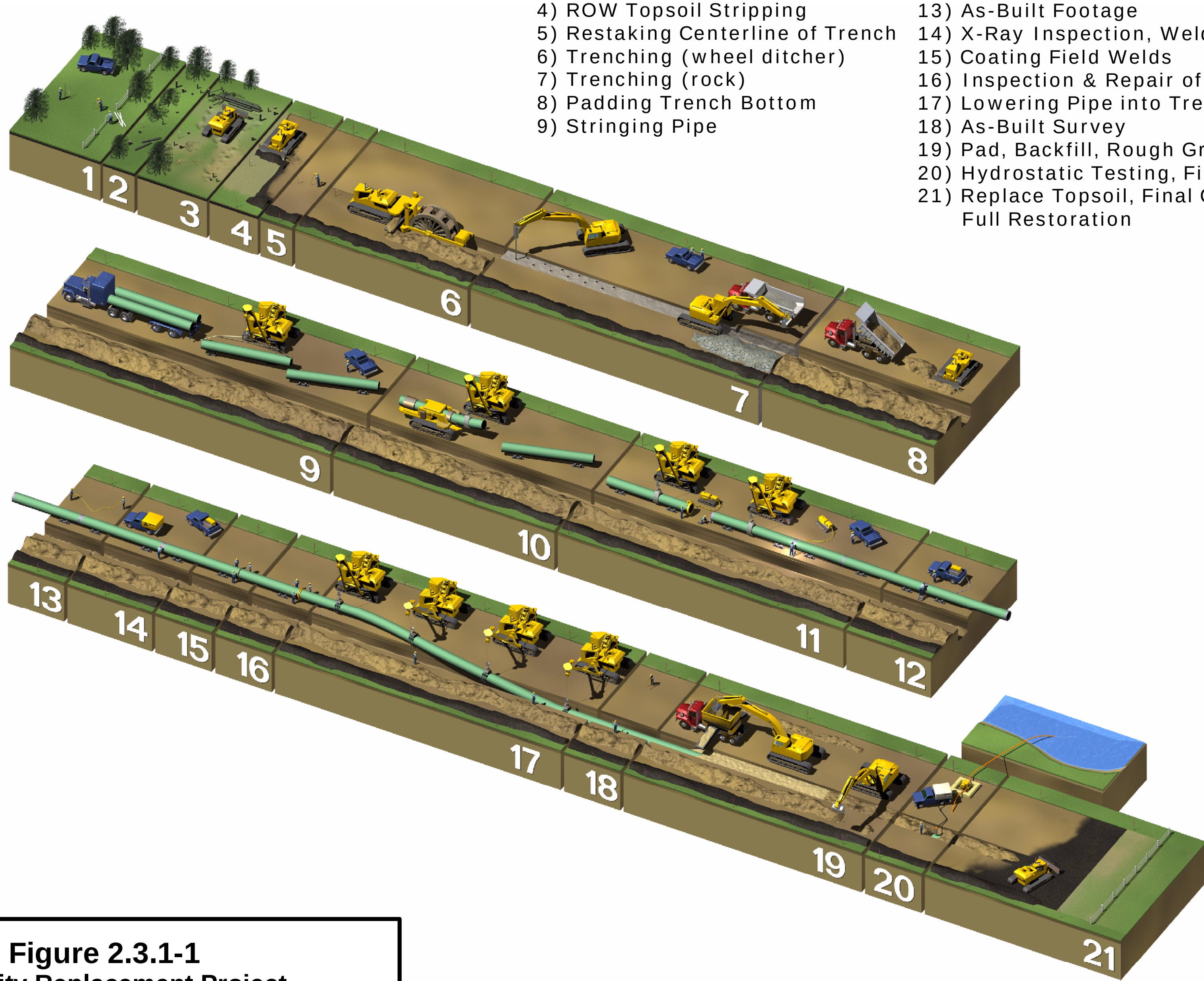
2.3.1 General Pipeline Construction Procedures

This section describes the general procedures proposed by Northwest for the construction of the pipeline facilities. Figure 2.3.1-1 shows the typical steps of cross-country pipeline construction. Northwest currently plans to use four general construction crews or "spreads" to build the pipeline over a period of approximately 8 months, with an average crew size of 300 workers and a peak crew size of 350 workers on each spread. The abandonment activities along the proposed loops would be completed by the construction spread for each loop. Separate crews would be used for construction of the aboveground facilities and abandonment activities along the remainder of Northwest's system as described in sections 2.3.3 and 2.3.4, respectively.

Standard pipeline construction is composed of specific activities that make up the linear construction sequence. These operations collectively include survey and staking of the right-of-way; clearing and grading; trenching; pipe stringing, bending, and welding; lowering the pipeline into the trench; backfilling the trench; hydrostatic testing; and cleanup and restoration. The procedures Northwest would follow to conduct these activities are described below. In addition, Northwest would use special construction techniques where warranted by site-specific conditions (see section 2.3.2).

Survey and Staking

The first step of construction would involve marking the limits of the approved work area (i.e., the construction right-of-way boundaries and temporary extra workspaces) and the pipeline centerline, and flagging the location of approved access roads. Establishing the clearing limits would preserve vegetation adjacent to the right-of-way and control erosion. Affected landowners would be notified before surveying and staking activities. Wetland boundaries and other environmentally sensitive areas would be marked or fenced for protection. Features of channel migration (e.g., channel migration areas, relic and overflow channels, spring brooks, and other fluvial features related to channel migration) would also be surveyed and staked. Underground utilities (i.e., cables, conduits, and pipelines) and agricultural drainages would be located and flagged to prevent accidental damage during construction. Fences would be braced and cut, and temporary gates and fences would be installed to limit public access or contain livestock, if present.



1) Survey and Staking
2) Clearing
3) Front-End Grading
4) ROW Topsoil Stripping
5) Restaking Centerline of Trench
6) Trenching (wheel ditcher)
7) Trenching (rock)
8) Padding Trench Bottom
9) Stringing Pipe
10) Field Bending Pipe
11) Line-Up, Initial Weld
12) Fill & Cap, Final Weld
13) As-Built Footage
14) X-Ray Inspection, Weld Repair
15) Coating Field Welds
16) Inspection & Repair of Coating
17) Lowering Pipe into Trench
18) As-Built Survey
19) Pad, Backfill, Rough Grade
20) Hydrostatic Testing, Final Tie-In
21) Replace Topsoil, Final Clean-Up, Full Restoration

Figure 2.3.1-1
Capacity Replacement Project
Typical Pipeline Construction Sequence

Clearing and Grading

A clearing crew would clear the work area of vegetation and obstacles (e.g., trees, logs, brush, and rocks). Timber would only be removed when absolutely necessary for construction purposes. Timber and other vegetative debris would be burned, chipped, or otherwise disposed in accordance with applicable local regulations. Burning would occur only if allowed by local authorities and air quality conditions permit. Appropriate fire prevention methods would be applied to minimize fire hazard and prevent heat damage to surrounding vegetation.

Once the right-of-way is cleared, it would be graded where necessary to create a reasonably level working surface to allow safe passage of equipment. Temporary erosion control measures (e.g., silt fence, straw bales) would be installed. Topsoil would be stripped and stockpiled along one side of the right-of-way in residential areas, agricultural lands, pastures, hayfields, and other areas at the landowner's request leaving the other side of the right-of-way to be used for access, material transport, and pipe assembly. In deep soils, Northwest would segregate the top 12 inches of topsoil. In areas where the topsoil layer is less than 12 inches, Northwest would make every effort to segregate the entire layer of topsoil. Northwest has requested a variance from the FERC staff's Plan to allow trenchline-only topsoil segregation. See section 4.2.2 for additional discussion of topsoil segregation, including the measures Northwest would implement to protect the topsoil on the working side of the right-of-way and return it to its original horizon after construction.

Channel migration features would not be filled, blocked, or otherwise altered where such alteration would cause the migration area to have an impact either up or downstream of the affected area.

Trenching

The trench would be excavated by rotary trenching machines, track-mounted backhoes, or other similar equipment. The trench would be excavated at least 12 inches wider than the diameter of the pipe at the bottom of the trench. The trench would be excavated to a sufficient depth to allow a minimum of 3 feet of soil cover between the top of the pipe and the final land surface after backfilling. In agricultural areas and at waterbody and road crossings, at least 5 feet of cover would be provided. As discussed above, the excavated topsoil would be stockpiled along the right-of-way on the side of the trench away from the construction traffic and pipe assembly area. Northwest proposes to spread the trench subsoil over the working side of the right-of-way during construction to pad the existing pipelines and minimize the need for additional construction right-of-way width (see section 4.2.2).

Pipe Stringing, Bending, and Welding

Steel pipe for the loops would be procured in 40- or 80-foot lengths (also referred to as joints), protected with an epoxy coating applied at the factory (the beveled ends would be left uncoated for welding), and shipped to strategically located pipe storage yards. The individual joints would be transported to the right-of-way by stringing truck and placed along the excavated trench in a single, continuous line on the working side of the trench.

The pipe would be delivered to the project site in straight sections. Some bending of the pipe would be required to enable the pipeline to follow natural grade changes and direction changes of the right-of-way. Selected joints would be bent in the field by track-mounted hydraulic bending machines as necessary before line-up and welding. Following stringing and bending, the joints of pipe would be placed on temporary supports adjacent to the trench for welding. Welding is one of the most crucial phases of pipeline construction because the overall integrity of the pipeline depends on this process. Each weld must exhibit the same structural integrity with respect to strength and ductility as the pipe. Only experienced welders highly proficient in pipeline welding and qualified according to applicable American

Welding Society, American Society of Mechanical Engineers (ASME), and American Petroleum Institute (API) standards would be used. The ends would be carefully aligned and welded together using multiple passes, which would provide for a full penetration weld.

Each weld would be inspected by quality control personnel to determine the quality of the weld. Governmental regulations require non-destructive testing of all welds in areas such as inside railroad or public road rights-of-way and in certain other areas. Radiographic examination is a non-destructive method of inspecting the inner structure of welds and determining the presence of defects. Contractors specializing in radiographic inspection would be engaged. Radiographic inspections would be performed as outlined in Title 49 CFR Part 192. Welds that do not meet established specifications would be repaired or removed. Once the welds are approved, the previously uncoated ends of the pipe at the joints would be cleaned and epoxy coated. The coating on the remainder of the completed pipe section would be inspected and any damaged areas repaired.

Lowering-in and Backfilling

Before the pipeline is lowered in, the trench would be inspected to be sure it is free of rocks and other debris that could damage the pipe or protective coating. If water is present in the trench, dewatering may be necessary to allow for inspection of the trench. Where dewatering is required, water would be pumped from the trench and discharged to upland areas using a filter bag or straw bale dewatering structure as specified in Northwest's ECR Plan (see Appendix G, drawing number 1408.34-X-0013). The dewatering structure would be sized to handle the volume of water in the trench. In accordance with the FERC staff's Procedures, dewatering would occur in a manner that does not cause erosion and does not result in heavily silt-laden water flowing into any waterbody.

In areas of rock, clean rock free padding or sandbags may be installed in the bottom of the trench to protect the pipeline. No topsoil would be used as padding material. After the pipe is lowered into the trench, the trench would be backfilled. Previously excavated materials would be pushed back into the trench using bladed equipment or backhoes. Where the previously excavated material contains large rocks or other materials that could damage the pipe and coating, clean fill or protective coating would be placed around the pipe prior to backfilling. Following backfilling in specified areas, a small crown may be left to account for any potential future soil settling.

Hydrostatic Testing

After burial, the pipeline would be tested to ensure the system is capable of withstanding the operating pressure for which it was designed. This procedure is called hydrostatic testing and is completed by pressurizing water in the pipeline. The loops would be divided into sections of pipeline to be tested individually. Each test segment would be determined based on water availability and terrain conditions. The water for hydrostatic testing would be obtained from municipal sources, except on the Fort Lewis Loop, where water would be obtained from the Centralia Canal. The Centralia Canal is a fish-bearing waterbody and a screening device would be necessary. Northwest would adhere to the specific requirements for pump intake screens, total volume and allowable rate of water withdrawal, and any other provisions included in the Hydraulic Project Approval and Temporary Water Use permit that would be issued by the WDFW and WDOE, respectively. The total volume and allowable rate of water withdrawal would be based on flow in the Centralia Canal at the time of construction. Water rights would be negotiated with Centralia Power. Northwest does not currently propose to withdraw hydrostatic test water from other surface waters. Test water would contact only new pipe and no chemicals would be added to the test water. Internal test pressures and durations would be in accordance with Title 49 CFR Part 192. If leaks are found, the leaks would be repaired and the section of pipe would be retested until specifications are met.

Upon completion of a test on a pipe segment, the water would either be pumped to the next segment to be reused for hydrostatic testing purposes or would be discharged. Northwest's proposed hydrostatic test water discharge locations are shown on the maps in Appendix B. All discharges, including testing for potential contaminants, would be conducted in accordance with the requirements for hydrostatic test water discharges included in Northwest's NPDES Individual Permit for Stormwater Discharges that would be issued by the WDOE. Northwest would test for chlorine before discharge if required by its NPDES permit. WDOE staff would conduct field reviews of Northwest's proposed hydrostatic test water discharge locations, as required, as part of the WDOE's permit review process. Based on this field review, modifications to the discharge locations would be made as necessary to ensure that the test water would infiltrate the ground before reaching sensitive areas.

The hydrostatic test water discharge would be directed into straw bale dewatering structures to dissipate energy and filter the test water. The dewatering structures would be constructed in accordance with the FERC staff's Procedures (see Appendix F), Northwest's ECR Plan (see Appendix G, drawing number 1408.34-X-0012), and applicable state permit requirements and would be sized to handle the required volume of water. The discharge rate would be controlled to prevent the water from flowing over the top of the dewatering structures and becoming a point source discharge. The dewatering structures would be located in upland areas at a significant distance from wetlands and waterbodies to promote infiltration and prevent sedimentation of wetlands, waterbodies, or other sensitive areas. No test water would be discharged directly to waterbodies or wetlands and no chlorinated water would be released into surface waters or wetlands. If it is not feasible to release water as described above, Northwest would need to submit alternative measures that would provide equal or better environmental protection and receive approval before use.

The release of hydrostatic test water would be visually monitored to ensure no erosion or sedimentation occurs and that turbid water is not discharged to a waterbody. If erosion or turbidity is observed, the dewatering operation would be immediately adjusted to ensure that erosion is stopped and water quality standards are not exceeded. Once a segment of pipe has been successfully tested and dried, the test cap and manifold would be removed, and the pipe would be connected to the remainder of the pipeline. Additional discussion of hydrostatic testing, including Northwest's proposed measures to notify and protect the public during the tests and additional details of water withdrawal from the Centralia Canal, is included in sections 4.3.1.4 and 4.3.2.7.

Cleanup and Restoration

During cleanup, construction debris on the right-of-way would be disposed of and work areas would be finish graded. Original land contours would be restored to conform to adjacent areas. In agricultural and residential areas, compacted subsoil would be disked, and the segregated topsoil would be returned as nearly as possible to its original horizon. Private and public property, such as fences, retaining walls, gates, driveways, and roads disturbed by construction would be restored to original or better condition consistent with individual landowner agreements. However, fences and retaining walls that had encroached upon Northwest's existing permanent easement would be set back from their original location to a distance of 5 feet off the centerline of the new 36-inch-diameter loop to allow Northwest to partially re-establish its easement (see section 4.8.3.1). Temporary and permanent erosion control measures, including revegetation of disturbed areas, would be implemented as specified in Northwest's ECR Plan (see Appendix G, drawing numbers 1408.34-X-0002, -0003, -0008, and -0009). Additional discussion of erosion control and revegetation measures is included in sections 4.2.2 and 4.5.2.

Markers showing the location of the pipeline would be installed at line-of-sight intervals, at public road and railroad crossings, and in other locations as necessary in accordance with DOT requirements. Pipeline markers would include the word "warning," "caution," or "danger;" identify the contents of the pipeline; and identify the operator and the emergency contact telephone number. Special markers providing information and guidance to aerial patrol pilots would also be installed as required in certain areas.

2.3.2 Special Pipeline Construction Procedures

Construction across roads; areas of steep terrain; wetlands and waterbodies; and residential, agricultural, and commercial/industrial areas would require special construction techniques. Special techniques would also be used if blasting is required. These techniques are discussed below.

Road Crossings

The pipeline would be buried to a depth of at least 5 feet below road surfaces and would be designed to withstand anticipated external loadings. Construction of the pipeline across major paved highways would usually be accomplished by boring under the roadbed. Boring requires the excavation of a pit on each side of the road, the placement of boring equipment in the pit, then boring a hole under the road at least equal to the diameter of the pipe. Once the hole is bored, a prefabricated pipe section would be pushed through the borehole. For long crossings, sections may be welded onto the pipe string just before being pushed through the borehole. There would be little or no disruption to traffic at road crossings that are bored.

Most smaller, unpaved roads and driveways would be open cut where permitted by local authorities or private owners. The open-cut method would require temporary closure of the road to traffic and establishment of detours. If no reasonable detour is feasible, at least one lane of the road being crossed would be kept open to traffic, except during brief periods when it is essential to close the road to install the pipeline. Most open-cut road crossings would be completed and the road resurfaced in 1 or 2 days. If an open-cut road crossing requires extensive construction time, provisions would be made for detours or other measures to permit traffic flow during construction.

Steep Terrain

Additional grading may be required in areas where the pipeline route crosses steep slopes. Steep slopes often need to be graded down to a gentler slope to accommodate pipe bending limitations. In such areas, the slopes would be cut away, and, after the pipeline is installed, reconstructed to their original contours during restoration. In areas where the pipeline route crosses laterally along the side of a slope, cut and fill grading may be required to obtain a safe, flat work terrace. Generally, on steep side slopes, soil from the high side of the right-of-way would be excavated and moved to the low side of the right-of-way to create a safe and level work terrace. After the pipeline is installed, the soil from the low side of the right-of-way would be returned to the high side, and the slope's original contours would be restored.

In steep terrain, temporary sediment barriers such as silt fence and straw bales would be installed during clearing to prevent the movement of disturbed soil off the right-of-way. Temporary slope breakers consisting of mounded and compacted soil or other materials such as silt fence, staked straw bales, or sandbags would be installed across the right-of-way during grading, and permanent slope breakers would be installed during cleanup. Following construction, seed would be applied to steep slopes and the right-of-way would be mulched in accordance with the recommendations of Northwest's ECR Plan (see Appendix G).

Wetland Crossings

Based on Northwest's field surveys, the proposed loops would cross 9.8 miles of wetlands in 264 jurisdictional wetland systems at 283 separate locations (see table J-1 in Appendix J). The majority of the wetlands that would be crossed (85 percent) are palustrine emergent wetlands that would revegetate within one growing season. The crossing of delineated wetlands would be in accordance with federal and state permits and following the measures in the FERC staff's Procedures except where variances to the Procedures are requested and approved by the FERC and other jurisdictional agencies (e.g., the COE, the WDOE, and local authorities) (see section 4.4.2). Wetland resources are discussed further in section 4.4.

Pipeline construction across wetlands would be similar to typical conventional upland cross-country construction procedures, with several modifications and limitations to reduce the potential for pipeline construction to affect wetland hydrology and soil structure. In non-agricultural wetlands, Northwest would typically use a 75-foot-wide construction right-of-way where the non-working side of the right-of-way and temporary extra workspace (topsoil storage area) would typically extend to the east 25 feet from the centerline of the proposed loop. The working side of the construction right-of-way would extend 50 feet to the west of the centerline of the proposed loop and would be over Northwest's existing 26-inch and 30-inch-diameter pipelines (see figure 2.2.1-1, sheet 3). Because the working side of the construction right-of-way would generally be located entirely within Northwest's existing permanent easement, most of the construction-related disturbance would occur to wetland areas that have been previously disturbed by past pipeline installation activities and are maintained in an emergent state.

Temporary extra workspaces may be required on both sides of wetlands to stage construction, fabricate the pipeline, and store materials. Temporary extra workspaces for wetland crossings would be located in upland areas a minimum of 50 feet from the wetland edge unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies. Where the loops cross disturbed emergent wetlands, such as agricultural areas (cropland, hayfields, and pastures), or where wetlands are confined to Northwest's existing permanent easement, Northwest proposes to use a 95-foot-wide construction right-of-way because those wetlands are degraded systems that are expected to fully recover within one full growing season. Use of a wider right-of-way in these disturbed systems would minimize the need for temporary extra workspaces in adjacent upland forested or shrub vegetation types that would require increased recovery times.

Construction equipment working in wetlands would be limited to that essential for right-of-way clearing, excavating the trench, fabricating and installing the pipeline, backfilling the trench, and restoring the right-of-way. In areas where there is no reasonable access to the right-of-way except through wetlands, non-essential equipment would be allowed to travel through wetlands only if the ground is firm enough or has been stabilized to avoid rutting. Otherwise, non-essential equipment would be allowed to travel through wetlands only once. However, the construction right-of-way may be used for access when the wetland soil is firm enough to avoid rutting or the construction right-of-way has been appropriately stabilized to avoid rutting (e.g., with timber riprap, prefabricated equipment mats, or terra mats).

Clearing of vegetation in wetlands would be limited to trees and shrubs, which would be cut flush with the surface of the ground and removed from the wetland. To avoid excessive disruption of wetland soils and the native seed and rootstock within the wetland soils, stump removal, grading, topsoil segregation, and excavation would be limited to the area immediately over the trenchline. A limited amount of stump removal and grading may be conducted in other areas if dictated by safety-related concerns. Topsoil segregation over the trenchline would only occur if the wetland soils were not saturated at the time of construction.

During clearing, sediment barriers, such as silt fence and staked straw bales, would be installed and maintained adjacent to wetlands and within temporary extra workspaces as necessary to minimize the potential for sediment runoff. Sediment barriers would be installed across the full width of the construction right-of-way at the base of slopes adjacent to wetland boundaries. Silt fence or straw bales installed across the working side of the right-of-way would be removed during the day when vehicle traffic is present and would be replaced each night. Alternatively, drivable berms may be installed and maintained across the right-of-way in lieu of silt fence or straw bales. Sediment barriers would also be installed within wetlands along the edge of the right-of-way, where necessary, to minimize the potential for sediment to run off the construction right-of-way and into wetland areas outside the work area. If trench dewatering is necessary in wetlands, silt-laden trench water would be discharged in upland areas at a significant distance from wetlands and waterbodies. The water would be discharged into an energy dissipation/sediment filtration device, such as a geotextile filter bag or straw bale structure, to minimize the potential for erosion and sedimentation. As discussed in section 2.3.1, the dewatering structures would be sized to handle the volume of water in the trench. If it is not feasible to release trench water as described above, Northwest would need to submit alternative measures that would provide equal or better environmental protection and receive approval before use.

The method of pipeline construction used in wetlands would depend largely on the stability of the soils at the time of construction. If wetland soils are not excessively saturated at the time of construction and can support construction equipment on equipment mats or timber riprap, construction would occur in a manner similar to conventional upland cross-country construction techniques. In unsaturated wetlands, the top 12 inches of topsoil from the trenchline would be stripped and stored separately from subsoil. Topsoil segregation generally would not be possible in saturated soils.

Where wetland soils are saturated and/or inundated, the pipeline may be installed using the push-pull technique. The push-pull technique would involve stringing and welding the pipeline outside of the wetland and excavating the trench through the wetland using a backhoe supported by equipment mats. The water that seeps into the trench would be used as the vehicle to “float” the pipeline into place together with a winch and flotation devices, which would be attached to the pipe. After the pipeline is floated into place, the floats would be removed and the pipeline would sink into place. Most pipe installed in saturated wetlands would be coated with concrete or equipped with set-on weights to provide negative buoyancy. After the pipeline sinks to the bottom of the trench, the trackhoe, working on equipment mats would backfill the trench and complete cleanup. Northwest proposes to use the push-pull technique to cross two wetland complexes, Olson Lake and Evans Creek, that are also considered waterbodies. Additional discussion of the push-pull technique is provided below in the waterbody crossing section.

Because little or no grading would occur in wetlands, restoration of contours would be accomplished during backfilling. Prior to backfilling, trench breakers (polyurethane foam or bags of sand) would be installed where necessary to prevent the subsurface drainage of water from wetlands. Where topsoil has been segregated from subsoil, the subsoil would be backfilled first followed by the topsoil. Topsoil would be replaced to the original ground level leaving no crown over the trenchline. In some areas where wetlands overlie rocky soils, the pipe would be padded with rock-free soil or sand before backfilling with native bedrock and soil. Equipment mats, timber riprap, and/or straw mats would be removed from wetlands following backfilling. After backfilling and major grading work are complete, any drivable berms would be removed and the ground surface returned to original contours. If a sediment control device is still needed at a location where a drivable berm was removed, a temporary sediment control device such as silt fencing would be installed.

Where wetlands are located at the base of slopes, permanent slope breakers would be constructed across the right-of-way in upland areas adjacent to the wetland boundary. Temporary sediment barriers would be installed where necessary until revegetation of adjacent upland areas is successful. Once revegetation is successful, sediment barriers would be removed from the right-of-way and disposed of properly.

In accordance with the recommendations of the local soil conservation authorities, the construction right-of-way in non-agricultural wetlands where no standing water is present would be seeded with Seed Mixture 4, which includes native species that occur in wetlands in the region. As recommended by the WDOE for disturbed emergent wetlands, agricultural wetlands that are dominated by introduced species would be seeded with Seed Mixture 3a. Lime, mulch, and fertilizer would not be used in wetlands. In accordance with the FERC staff's Procedures, Northwest would monitor the success of wetland revegetation annually for a period of 3 years after construction, or until the wetland is successfully revegetated. In scrub-shrub and forested wetlands, the monitoring period would be extended to 10 years as required by the WDOE. Wetland restoration and monitoring are discussed further in section 4.4.2.

Waterbody Crossings

A total of 154 waterbodies, including 55 perennial waterbodies and 99 intermittent streams or ditches would be crossed by the loops associated with the Capacity Replacement Project. The waterbodies that would be crossed and Northwest's proposed crossing method for each are listed in table K-1 in Appendix K and include 6 major waterbodies (greater than 100 feet wide), 20 intermediate waterbodies (greater than 10 feet wide but less than or equal to 100 feet wide), and 128 minor waterbodies (less than or equal to 10 feet wide). Final crossing methods would be determined through consultations with the jurisdictional agencies as part of their permit decisions. Of these waterbodies, 50 perennial and 20 intermittent waterbodies are designated coldwater fishery resources. One additional intermittent waterbody would be crossed by the abandonment activities associated with the Portland Lateral Take-off. Surface water resources are discussed further in section 4.3.2; aquatic resources are discussed in section 4.6.2.

The waterbody crossings would be constructed in accordance with federal, state, and local permits and, for those waterbodies that have perceptible flow at the time of construction, in accordance with the FERC staff's Procedures except where variances to the Procedures are requested and approved by the FERC and other jurisdictional agencies (e.g., the COE, the WDOE, and the WDFW) (see section 4.3.2.2). Standard waterbody construction measures related to typical temporary extra workspace, temporary bridging, clearing of vegetation, sediment control, timing, and pipe burial depths are described below. Northwest has identified specific construction methods it would use at each waterbody, including the dry and wet open-cut, flume, dam and pump, HDD, aerial span, and push-pull construction methods. These construction methods are described below. Two other waterbody crossing methods, the diverted dry open-cut method and the bore method, are also described below. Although Northwest does not propose to cross any of the waterbodies using these methods, they are described because they have been recommended by land management and resource agencies and are evaluated as potential alternatives to Northwest's proposed crossing methods in section 4.3.2.3.

Temporary extra workspaces would be required on both sides of all waterbodies to stage construction, fabricate the pipeline, and store materials. The amount of pipe required to cross a waterbody would be stockpiled in temporary extra workspaces on one or both sides of the waterbody. These temporary extra workspaces would be located a minimum of 10 feet from the waterbody edge in actively cultivated or rotated cropland or other disturbed land and 50 feet from the waterbody edge in other areas unless site-specific approval for a reduced setback is granted by the FERC and other jurisdictional agencies.

To prevent sedimentation caused by construction and vehicular traffic crossing perennial waterbodies for access to the right-of-way, Northwest would install temporary equipment bridges to allow construction equipment to cross. Although the FERC staff's Procedures allows the clearing crew to make one pass through a waterbody before the equipment bridge is installed, Northwest's clearing crew would set the bridge before crossing a waterbody. Northwest would be required to obtain an Hydraulic Project Approval from the WDFW before bridge placement at all streams. To obtain this approval, Northwest would need to provide the WDFW with the specific bridge locations either on maps or in tabular form by milepost location. The Hydraulic Project Approval would cover all phases of bridge installation, maintenance, removal, and streambank restoration. Therefore, no machinery would ford flowing streams. Based on Northwest's currently proposed schedule, any bridges necessary to support the HDD crossings would be installed in the fall of 2005; the bridges needed for the remainder of the construction activities would be installed beginning in May of 2006. The bridges would most likely be railcar flatbeds or fabricated mats. Soil would not be used to construct or stabilize the bridges and they would be designed and maintained to prevent soil from entering the waterbody. Each bridge would be designed and maintained to withstand and pass the highest flow expected to occur while the bridge is in place.

Before bridge installation, erosion control measures such as silt fence would be placed to prevent streambank materials from entering the water should the bank fail or slough off. If reasonable alternative access to the right-of-way is available, the bridges would be removed as soon as possible after final cleanup. Northwest expects that all bridges would be removed by December of 2006. In the following year, restoration crews would use the right-of-way and access roads whenever possible. If no other access route is possible, the restoration crew would set a bridge before crossing any waterbody.

Clearing adjacent to waterbodies would involve the removal of trees and brush from the construction right-of-way and temporary extra workspaces. Woody vegetation within the construction right-of-way would be cleared to the edge of the waterbodies. The clearing crew would leave the root systems in place and not grade until the trench is dug to install the pipe.

Northwest would implement the FERC staff's Plan and Procedures and its ECR Plan and comply with its NPDES stormwater and other state and local permit conditions to minimize impacts from erosion and sedimentation. Sediment barriers would be installed immediately after initial disturbance of the waterbody or adjacent upland. Sediment barriers would be properly maintained throughout construction and reinstalled as necessary (such as after backfilling of the trench) until replaced by permanent erosion controls or restoration of adjacent upland areas is complete and revegetation has stabilized the disturbed areas.

Prior to initiating in-stream construction, the pipe segment for a crossing would be fabricated and stored in adjacent temporary extra workspaces. To minimize the possibility of construction interfering with fish migration and spawning in coldwater fisheries, in-stream construction would be conducted between the dates specified in table K-1 in Appendix K unless other time windows are permitted or required by the WDFW. In addition, in-stream construction activities would be limited to 24 hours in minor waterbodies and 48 hours in intermediate waterbodies. The intermittent streams and ditches are expected to be dry at the time of construction based on the proposed summer construction schedule. Generally, the perennial waterbodies would also be crossed during low flow periods, which would avoid and minimize the potential for impacts.

Northwest would install the pipeline in waterbodies with a minimum of 5 feet depth of cover from the top of the pipe to the bottom of the streambed. In waterbodies that have a potential for scour, Northwest would increase the depth of cover as necessary (see section 4.3.2.4).

Dry Open-Cut Construction Method – For the 75 intermittent waterbodies expected to be without flow at the time of construction (see table K-1 in Appendix K), Northwest would utilize the dry open-cut method, which involves the standard upland, cross-country construction methods described in section 2.3.1. This method would be used only when no flowing water is present in waterbodies. After backfilling, the streambanks would be reestablished to approximate preconstruction contours and stabilized, and erosion and sediment control measures would be installed across the construction right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody. Intermittent waterbodies that are flowing at the time of construction would be crossed using a "dry" stream crossing construction method (e.g., flume or dam and pump).

Diverted Dry Open-Cut Construction Method – The diverted dry open-cut method involves the temporary diversion of a portion of a waterbody to minimize contact between streamflow and excavation and backfill activities during pipeline installation. Diversion structures may consist of one or a combination of the following: imported riprap, concrete jersey barriers, water bladder portadams, and sandbags.

The diversion dams would be located on a site-specific basis at a certain distance upstream of the crossing and run from the bank on the side the work is to be performed diagonally downstream past the center of the waterbody. After reaching a point past the center of the waterbody, the dam would turn downstream and parallel the axis of the waterbody past the pipeline crossing. Once the necessary distance past the pipeline crossing, the dam would turn back to the bank of origin. The "dry" side of the river would then be excavated and a pipe section placed in the trench. Trench boxes or sheet pilings would be placed at the end of the pipe section in the middle of the streambed for the tie-in. The trench would then be backfilled except for the tie-in area.

A second dam would then be installed that would divert the water to the backfilled area. This second dam would converge with the first dam at the diversion origin. Segments of the first dam would be rearranged to divert the water to the second dam. Once the diversion is completed, excavation of the other half of the streambed would begin. Following excavation, the second pipe section would be carried in and tied-in to the first section and the trench backfilled. The area would be recontoured and revegetated following installation.

Northwest does not propose to use the diverted dry open-cut method at any of the waterbody crossings; however, it has been recommended by resource agencies and Native American tribes and is evaluated as a potential alternative to Northwest's proposed crossing methods in section 4.3.2.3.

Wet Open-Cut Construction Method – The wet open-cut construction method involves trench excavation, pipeline installation, and backfilling in a waterbody without controlling or diverting streamflow (i.e., the stream would flow through the work area throughout the construction period). Figure 2.3.2-1 depicts the typical wet open-cut crossing method. Northwest proposes to use the wet open-cut method at two waterbodies that are coldwater fisheries (Pilchuck Creek and the Nisqually River). According to Northwest, these waterbodies cannot be feasibly crossed using any other method primarily because of their width, volume of water, streambed characteristics, and surrounding topographic constraints (see discussion in section 4.3.2.3). Northwest proposes to cross three additional waterbodies by this method if the proposed HDD crossing method at those waterbodies failed (see section 4.3.2.3). With the wet open-cut method, the trench would be excavated across the stream using trackhoes or draglines working within the waterbody, on equipment bridges, and/or from the streambanks. For smaller streams, the trench spoil would be typically stored in an upland area adjacent to the stream. For larger waterbodies where excavated spoil cannot be readily stored in an upland area, the excavated trench material would be stored within the stream on the downstream side of the trench to reduce additional handling or relaying of the spoil and minimize the duration of in-stream activities. The spoil would be stored in piles with breaks in between to allow for water passage. The stream substrate would influence the stability of the trench walls and directly affect the time required to adequately excavate the trench and complete the crossing.

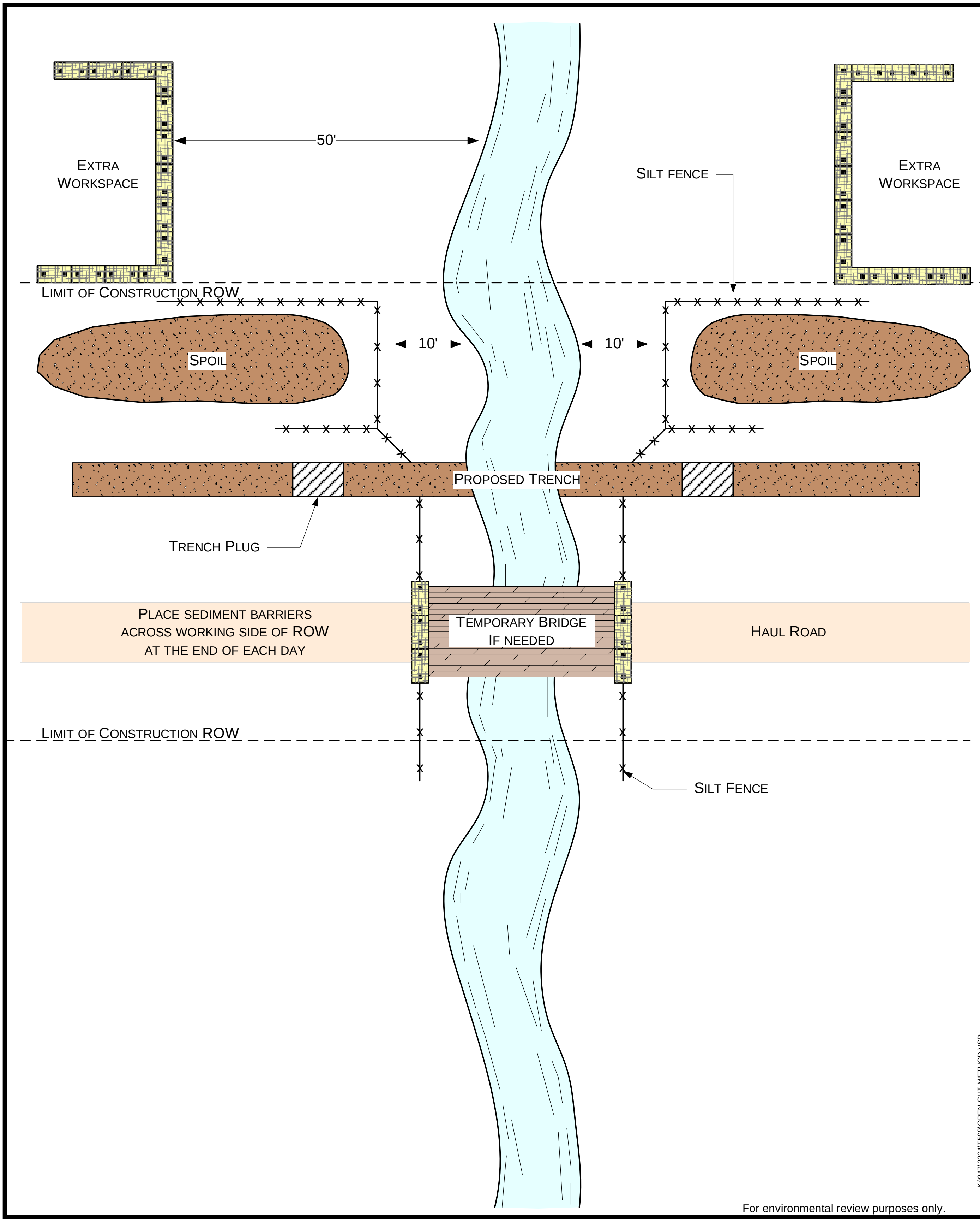


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Figure 2.3.2-1

Capacity Replacement Project

Typical Wet Open-Cut Method

Waterbody Crossing

Throughout in-stream excavation operations, typically a trench plug (consisting of compacted or unexcavated native soil) would be left in place between the upland trench and the waterbody. This plug would prevent migration of water into upland portions of the pipeline trench and keep accumulated trench water out of the waterbody. The trench plugs would be left in place until the pipe is ready for installation.

Once trench excavation across the entire waterbody is complete, a prefabricated section of pipe would be promptly lowered into the trench. The trench would then be backfilled with the previously excavated material, and the pipe section tied-in to the pipeline. If dewatering is necessary to weld the tie-in, the trench water would be pumped out in a controlled manner and discharged to a straw bale structure typically located in an upland area where heavier sediments and suspended particles can be filtered before the discharge reaches the stream.

Following pipe installation and backfilling, the streambanks and channel would be reestablished and stabilized. Where the streambanks were in good condition before installation of the pipeline, the banks would be restored to preconstruction contours or to a stable angle of repose as approved by the Environmental Inspector (EI). Where the existing streambanks and channel were in substandard condition, Northwest would work to reconstruct the banks and channel where feasible in consultation with the WDFW (see section 4.3.2.4). Erosion and sediment control measures would be installed across the right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody.

<u>Flume Construction Method</u> – The flume method is a standard dry waterbody crossing construction method that involves diverting the flow of water across the trenching area through one or more flume pipes placed in the waterbody. The typical flume crossing method is depicted on figure 2.3.2-2. Northwest proposes to use the flume method to cross 66 waterbodies, including 1 waterbody affected by the Portland Lateral Take-Off abandonment activities if they are flowing at the time of construction (see table K-1 in Appendix K). If these streams are not flowing at the time of construction, they would be crossed using the dry open-cut method described above. Two additional waterbodies (Jim Creek and Tributary to North Fork Nooksack River) would also be crossed by this method if the proposed HDD crossing method at the waterbody failed (see section 4.3.2.3). The first step in the flume crossing method would involve placing a sufficient number of adequately sized flume pipes in the waterbody to accommodate the highest anticipated flow during construction. Before the flume pipe is installed at the waterbody, it would be inspected to ensure it is free of dirt, grease, oil, or other pollutants. Excessive dirt would be removed. The pipe would be steam-cleaned, if necessary, to remove any oil or grease present before placement in the stream.

After placing the pipe in the waterbody, sand or pea gravel bags, water bladders, or metal wing deflectors would be placed in the waterbody upstream and downstream of the trench area. These devices would serve to dam the stream and divert the water flow through the flume pipes, thereby isolating the water flow from the construction area between the dams. Several measures would be taken to minimize short-term increases in turbidity during dam construction, including: 1) all in-stream work would be carried out on foot and no equipment would operate in the streambed; 2) sandbags would be filled with a non-leachable material such as clean, prewashed sand; 3) sandbags would be tied securely before they are installed; and 4) sheets of plastic would be interwoven between the layers of sandbags to ensure an effective seal. Leakage from the dams, or subsurface flow from below the waterbody bed, may cause water to accumulate in the isolated area. As water accumulates in this area, it may be periodically pumped out and discharged into energy dissipation/sediment filtration devices, such as a geotextile filter bag or straw bale structure, or into well-vegetated areas away from the water's edge.

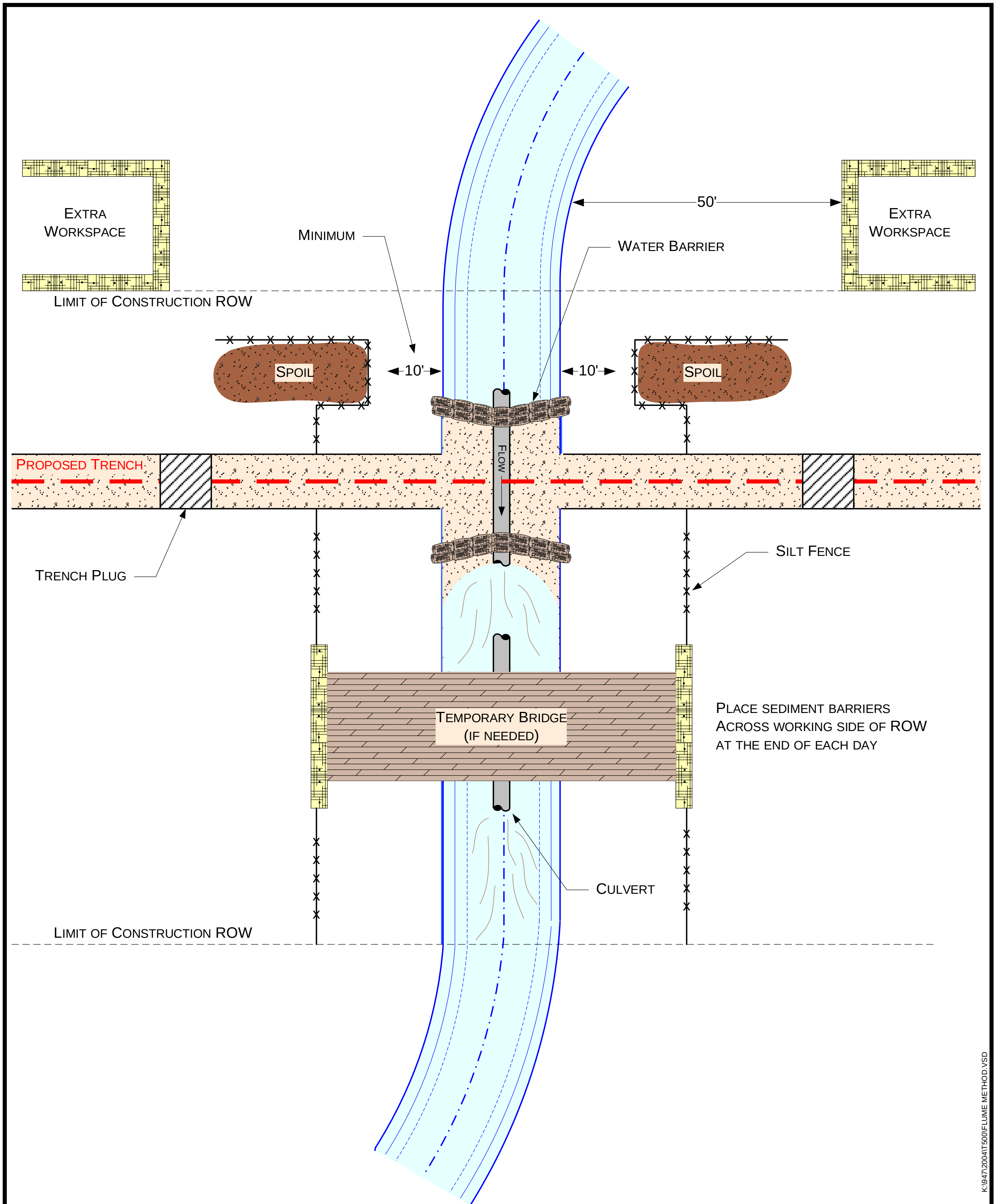

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Figure 2.3.2-2
Capacity Replacement Project
Typical Flume Method
Waterbody Crossing

Trackhoes located on both banks of the waterbody would excavate a trench under the flume pipe in the dewatered streambed. Spoil excavated from the waterbody trench would be placed or stored a minimum of 10 feet from the edge of the waterbody. Once the trench is excavated, the prefabricated segment of pipe would be installed beneath the flume pipes. The trench would then be backfilled with native spoil from the waterbody bed. Immediately following pipe installation and backfilling, and before removing the dams and flume pipes and returning flow to the waterbody channel, the streambanks and channel would be reestablished and stabilized. As discussed above for the wet open-cut method, where the streambanks were in good condition before installation of the pipeline, the banks would be restored to preconstruction contours or to a stable angle of repose as approved by the EI. Where the existing streambanks and channel were in substandard condition, Northwest would work to reconstruct the banks and channel where feasible in consultation with the WDFW (see section 4.3.2.4). Erosion and sediment control measures would be installed across the construction right-of-way to reduce streambank and upland erosion and sediment transport into the waterbody. Sediment barriers, such as silt fence and/or straw bales or drivable berms would be maintained across the right-of-way at all waterbody approaches until permanent vegetation is established. After backfilling and major grading work are complete, any drivable berms would be removed and the ground surface returned to original contours. If a sediment control device is still needed at a location where a drivable berm was removed, a temporary sediment control device such as silt fencing would be installed. Equipment bridges would be removed when construction and restoration are completed.

<u>Dam and Pump Construction Method</u> – The dam and pump method is a standard dry waterbody crossing construction method that may be used as an alternative to the flume method for waterbodies less than 10 feet wide. Northwest proposes to use the dam and pump method at two waterbody crossings (see table K-1 in Appendix K). The typical dam and pump crossing method is depicted on figure 2.3.2-3. This method is similar to the flume crossing method except that pumps and hoses would be used instead of flumes to move water across the construction work area. The technique involves damming of the waterbody with sandbags and/or steel plates upstream and downstream of the trench area. Pumps would be set up at the upstream dam with the discharge line routed through the construction area to discharge water immediately downstream of the downstream dam. An energy-dissipation device would be used to prevent scouring of the streambed at the discharge location. Water flow would be maintained through all but a short reach of the waterbody at the actual crossing. The pipeline would be installed and backfilled. After backfilling, the dams would be removed and the banks restored and stabilized as discussed above for the wet open-cut and flume methods.

<u>HDD Construction Method</u> – Northwest proposes to cross three coldwater fisheries, the North Fork Nooksack, North Fork Stillaguamish, and South Fork Stillaguamish Rivers, using the HDD method. Two other coldwater fisheries (Jim Creek and Tributary to North Fork Nooksack River) would also be crossed by the HDD method because they are within the drilling radius (between the entry and exit points) of the North Fork Nooksack River HDD crossing. In its comments on the draft EIS, Snohomish County requested that the use of the HDD method be considered to cross all coldwater fisheries in Snohomish County (see section 4.3.2.3).

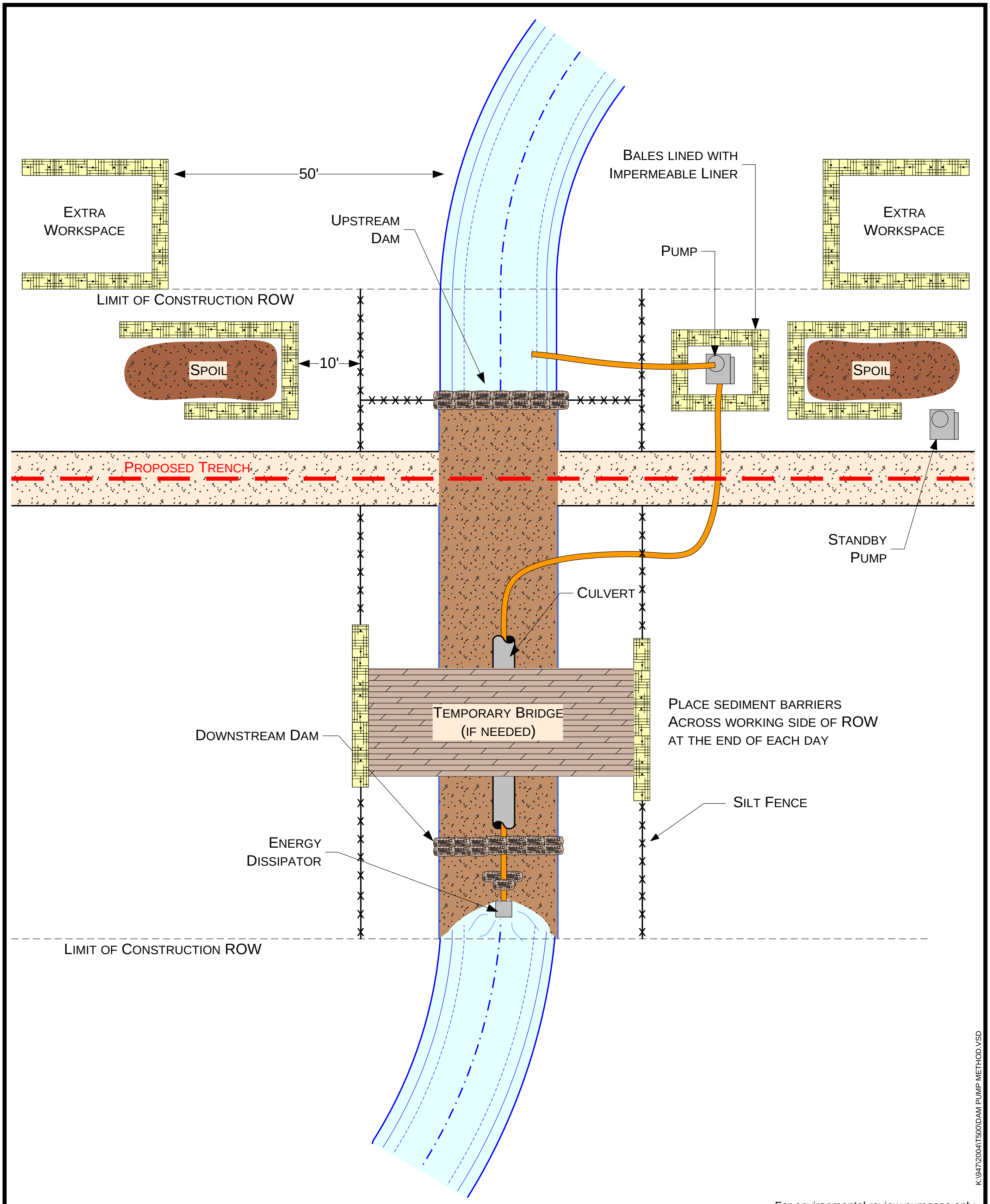

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Figure 2.3.2-3

Capacity Replacement Project

Typical Dam and Pump Method

Waterbody Crossing

The HDD method involves drilling a pilot hole under the waterbody and banks, then enlarging that hole through successive reamings until the hole is large enough to accommodate the pipe. The drill rig would be staged in a large extra workspace set back from the waterbody banks. Pipe sections long enough to span the entire crossing would be staged and welded along the construction work area on the opposite side of the waterbody and then pulled through the drilled hole. Figure 2.3.2-4 shows a conceptual HDD waterbody crossing. As shown on figure 2.3.2-4, use of an HDD avoids disturbance to both the waterbody and the vegetation on both sides of the crossing.

Drilling a pilot hole is the first phase of the HDD and establishes the ultimate position of the installed pipeline. The head of the pilot drill string contains a pivoting head that can be controlled by an operator at the surface as the drill progresses. Typically, the pilot hole would be directed downward at an angle until the proper depth is achieved, then turned and directed horizontally for the required distance, and finally angled upward back to the surface. Tracking and steering of the drill head would be guided using two insulated wires (approximately 0.25 inch) laid on the ground surface. A probe located behind the drill bit would detect an electric current in the wires and utilize triangulation to locate the head of the drill bit to make steering adjustments. Throughout the process of drilling and enlarging the hole, a slurry made of naturally occurring, non-toxic bentonite clay and water would be pressurized and pumped through the drilling head to lubricate the drill bit, remove drill cuttings, and hold the hole open. This slurry, referred to as drilling mud or drilling fluid, has the potential to be inadvertently released to the surface if fractures or fissures are encountered in the substrate during drilling.

The potential for an inadvertent release of drilling mud (also referred to as a frac-out) is generally greatest during drilling of the pilot hole when the pressurized drilling mud is seeking the path of least resistance. The path of least resistance is typically back along the path of the drilled pilot hole. However, if the drill path becomes temporarily blocked or encounters other areas such as large fractures or fissures that lead to the ground surface or waterbody, then an inadvertent release could occur. Northwest would monitor the pipeline route and the circulation of drilling mud throughout drilling for indications of an inadvertent release and would immediately implement corrective actions if a release is observed or suspected to be occurring. The corrective actions Northwest would implement are outlined in its HDD Plan (see Appendix I) and would range progressively from an initial temporary suspension of drilling and assessment of the cause and severity, to potentially a complete abandonment of the HDD based on the location and volume and Northwest's ability to contain and control the release. All impact evaluations and decisions associated with a frac-out would be made in consultation with the applicable agencies.

Once the pilot hole exits in an acceptable location, the reaming operation is initiated. During the reaming phase, a reaming head would be attached to the drill pipe and pulled back through the pilot hole to enlarge it. Several reaming passes would be made with incrementally larger reaming heads to enlarge the hole to approximately 1.5 times the diameter of the pipeline. As the drill path becomes larger, the potential for an inadvertent release generally would decrease as the path of least resistance becomes increasingly well established. High-pressure drilling fluid would continue to be jetted through the reaming head to float out drill cuttings and debris, to cool the drilling head, and to provide a cake wall to stabilize the hole. Once the drill hole is enlarged to the proper diameter, the pipe would be pulled back through the reamed hole. The HDD at the North Fork Nooksack River is anticipated to take about 10 weeks. The HDDs at the North and South Fork Stillaguamish Rivers are anticipated to take about 5 weeks each.

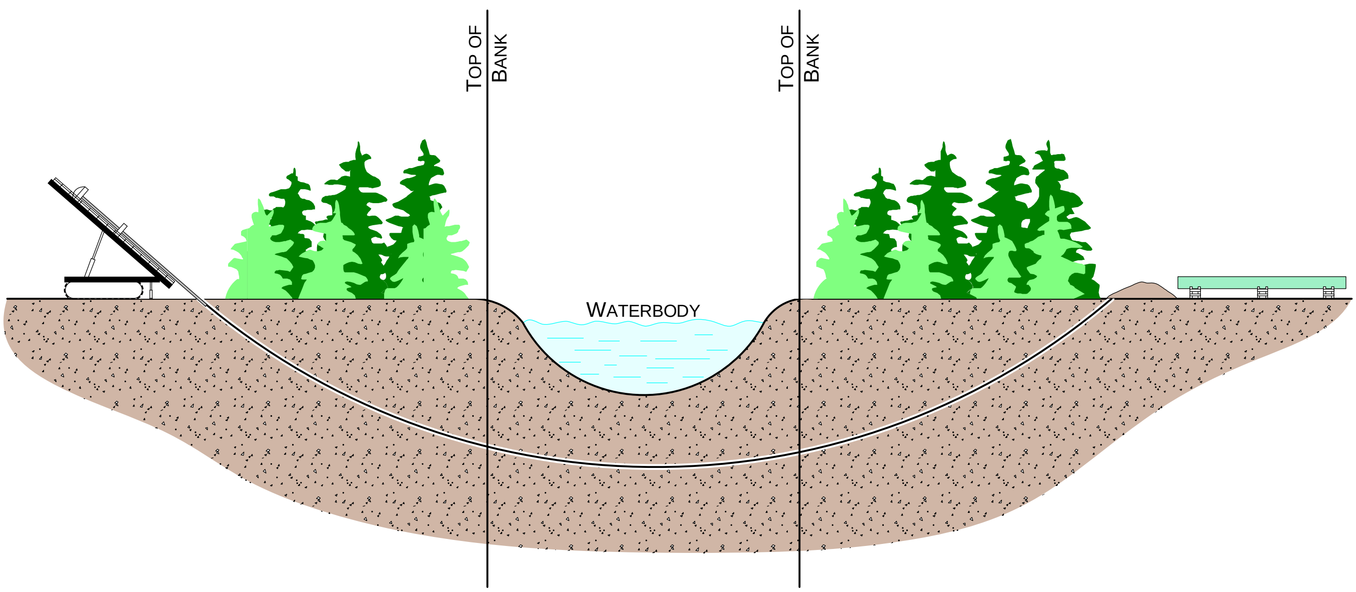

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Figure 2.3.2-4

Capacity Replacement Project

Conceptual Horizontal Directional Drill
Waterbody Crossing

Aerial Span Construction Method – Northwest proposes to use the aerial span method to cross two coldwater fisheries, Colin Creek and the Centralia Canal. The existing 26-inch- and 30-inch-diameter pipelines were installed as aerial spans at those locations as well. Northwest believes the aerial span method is also the only technically feasible method to cross two additional coldwater fisheries, Pilchuck Creek and the Nisqually River, if the preferred crossing method (wet open cut) is not approved at those locations and there are no underground options. Aerial span installations are generally only practical in selected locations where an existing structure is present or in narrow deeply incised ravines or in deep, narrow canyons where geologic and topographic conditions or other constraints restrict other crossing techniques. For example, the aerial crossing of Colin Creek is necessary because the creek is located in a deep ravine within a residential subdivision. The homes located on both sides of the waterbody at the crossing location, as well as the existing 30-inch-diameter pipeline, preclude the use of sufficient amounts of temporary extra workspace needed to trench through the deep ravine and comply with depth of cover requirements specified by the DOT. The WDFW has commented that further investigation at this site would be conducted by the permitting agencies to determine whether other construction techniques may be possible in order to bury the new pipe. The Colin Creek crossing is discussed in additional detail in sections 4.3.2.3 and 4.8.3.1. The aerial span method involves constructing the pipeline aboveground by attachment to an existing structure (e.g., railroad or road bridge), developing a new structure for attachment (e.g., suspension or host bridge), or spanning a waterbody without support structures. There are no existing bridges at the potential aerial span crossings and support structures would be required; therefore, Northwest would span waterbodies by developing new structures.

There can be two types of support towers: rectangular frame or A-frame. The rectangular tower looks like a miniature version of the Golden Gate Bridge and the A-frame is an "A" shape truss that has two slanted columns connected at the top of the tower. The towers would be between 20 to 30 feet in height. The footprint of the towers would be approximately 20 feet wide between the two columns and 20 feet between the front legs and backstay legs or up to 100 feet between the front legs and the backstay cable anchors.

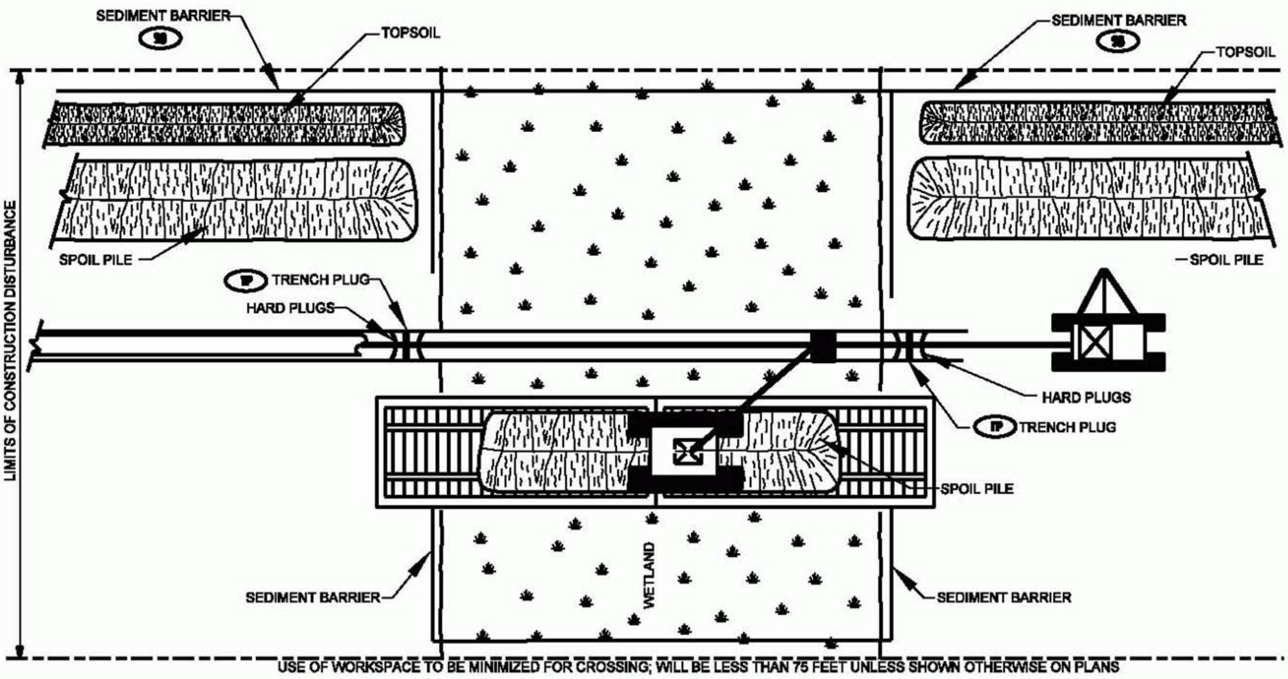
With the aerial span method, soil disturbance is typically limited to areas bordering the waterbody. Temporary extra workspace would be required on each bank between the tower and cable anchorage. Additional extra workspace would be required to weld up the pipe section and stage the equipment required to install the pipeline on the support structure. The towers and anchors would be constructed on the waterbody banks and the main cable needed to pull the pipe string across the waterbody to be installed on the support structure would be carried across the waterbody by boat. Therefore, no in-stream disturbance would occur. It is estimated that an aerial span crossing could take up to 60 days to construct, depending on the accessibility of the site.

Bore Construction Method – The bore method is similar to the HDD method in that the pipeline is installed beneath a feature without surface disturbance to the feature during the crossing. However, the bore method differs in that the path of the pipeline across the feature is straight and is not variable or directional as in an HDD where the path is curved or arched. The maximum length of a bore (hundreds of feet) is also much less than the maximum length of an HDD (thousands of feet). Boring is frequently utilized at paved road and railroad crossings and is not a common crossing method for waterbodies primarily because of the difficulty in managing groundwater during the installation. However, during the scoping process Fort Lewis requested that Northwest use the bore method to cross two coldwater fisheries, Muck Creek and South Fork Creek, on the military reservation. In its comments on the draft EIS, the WDFW requested that the use of the bore method also be considered to cross Saar Creek. A detailed discussion of these creek crossings, including the reasons Fort Lewis and the WDFW requested the use of the bore method, is presented in section 4.3.2.3.

As described in section 2.3.3 for road crossings, boring requires excavation of pits on each side of the feature. Boring operations require relatively large work areas, and well points or pumping for continuous dewatering operations, and may require continuous spoil/slurry processing throughout construction of the crossing. During a standard boring operation, spoil from the bore is carried into the pit as the crossing is being completed and then removed by trackhoes to provide room for the pipe to be welded and eventually pulled through the bore hole. The operator for the boring machine, welders, and several laborers would work in the bore pit. Trench boxes or sheet piling may be used to support the pit walls and to help cut off groundwater inflows. Dewatering systems using deep wells or well points are frequently employed. The specific type of bore (e.g., jack and bore, slick bore, hammer bore) that would be utilized in a given area depends on the construction site characteristics, the type of soils present, and the contractor's familiarity with available methods.

Push-Pull Construction Method – Northwest proposes to use the push-pull construction method to cross two waterbodies that are also considered wetland complexes, Olson Lake and Evans Creek. Olson Lake contains resident cutthroat trout, with anadromous coho, cutthroat, and steelhead further downstream. Evans Creek contains anadromous chinook salmon, coho salmon, and cutthroat trout. Downstream flow is expected at both waterbodies/wetland complexes at the time of construction. The typical push-pull crossing method is depicted on figure 2.3.2-5. Northwest anticipates flooded conditions during construction of these two crossings and has selected this method in accordance with the FERC staff's Procedures. The FERC staff's Procedures recommends the use of a "push-pull" or "float" technique to place the pipe in the trench where water and other site conditions allow. If the conditions are too dry to use the push-pull method at the time of the crossings, Northwest proposes to use the standard procedures described above for wetland crossings. Northwest would schedule the crossings of Olson Lake and Evans Creek during the driest part of the season (August) when water levels are low and when potential impacts from the crossings would be minimized.

Using this construction method, the clearing equipment would work off equipment mats to provide a stable working surface and minimize disturbance. To minimize off right-of-way turbidity and to contain saturated spoil material on the construction right-of-way, silt fences/sediment curtains would be installed on both sides of the construction work area. The silt fences/sediment curtains would be installed on either side of the construction right-of-way at the Olson Lake crossing during the dry season to minimize off-site migration of trench spoils and sediments. At the Evans Creek crossing, silt fences/sediment curtains would be installed using standard silt fence and/or other similar materials, as necessary, to contain trench spoil and sediment on the construction right-of-way. Silt fence/sediment curtain materials that may be used include support posts of appropriate length made from wood or metal (i.e., chain link fencepost) with geotechnical fabric or silt fence material to provide a silt curtain barrier to minimize/prevent migration of sediment and trench spoil. The support posts would be of sufficient length to anchor in the wetland substrate and spaced at a distance to ensure curtain stability. Because vegetation clearing activities are not expected to occur in the saturated conditions, it may be necessary to install the silt fences/sediment curtains as the timber mats are being laid down. The silt fences/sediment curtains would be installed before or at the same time the prefabricated timber mats are being laid to support the excavating equipment. The prefabricated timber mats would be used to minimize compaction and disturbance as well as to store the excavated trench spoil material. The timber mats would be laid on top of the existing vegetation (willows and spirea).



NOTES:

1. Contractor shall utilize this method for wetland pipelay where support of construction equipment on mats for excavation, stringing, welding, pipelay, backfilling and restoration is very difficult due to saturated conditions.

2. During a push-pull crossing, the trench is typically excavated by a single trackhoe, which is utilizing the excavated spoil to build a travel path through the swamp.

   Alternatively the Contractor may utilize amphibious excavators (pontoon mounted backhoes) or tracked backhoes supported by fabricated timber mats or floats, to excavate the trench.

3. Topsoil salvage will not be required in saturated wetlands.

4. Contractor shall install sediment barriers at the wetland edge and maintain same throughout construction to the extent possible to prevent surface runoff from the upland construction area and upland spoil storage areas from entering the wetland.

5. Contractor shall fabricate the pipe string in an adjacent upland area and add floats to the pipe string. Equipment/winches located on the adjacent upland areas will push or pull the pipe string across wetland.

6. Once the pipe is floated in the entire trench the floats are cut allowing the pipe to sink. The trackhoe then retraces its path removing the spoil from the travel lane and replacing it in the trench over the pipe.

7. Trench plugs will be installed at the wetland edges.

8. Erosion and sediment control measures shall be inspected daily and contractor shall repair if necessary.

9. Contractor shall place signage 100 feet back from wetland boundary and advise no refueling of mobile equipment within 100 feet of stream bank. Refuel stationary equipment as per SPCC Plan.

10. Contractor shall restore grade to near pre-construction topography, replace topsoil where salvaged, and install permanent erosion controls.

11. Contractor shall remove any timber mats or fill from wetland upon completion.

12. Contractor shall avoid adjacent wetlands and install sediment barriers (straw bales and/or silt fence) at edge of right-of-way along wetland edge as required.

13. Contractor shall leave hard plugs at edge of wetland, until just prior to trenching.

14. Wetland boundaries shall be flagged prior to clearing.

Figure 2.3.2-5

Capacity Replacement Project

Typical Push-Pull Method

Waterbody/Wetland Crossing

The trench excavation equipment would proceed forward across the wetland, digging the trench and placing the spoil in front of or behind the trackhoe on top of the timber mats. Because of the expected saturated conditions, the topsoil and subsoil would not be segregated. The excavated trench would fill with water. As the trench is being excavated, the pipe string would be laid or strung out in adjacent upland areas. The joints would be welded together, x-rayed, and coated. Floats would be attached to the pipe string. The pipe string would be set on rollers to facilitate the push-pull operations. A pulling head would be attached to the initial joint of the pipe string to seal the pipe and to provide an attachment to pull the pipe. A swivel would be attached to the pulling head. Winches located on the opposite side of the wetland would pull the pipe into the trench and across the wetland floated in the trench. Alternatively, a sideboom or trackhoe would pull the pipeline string across the wetland floated in the trench.

After the pipe has been floated across the wetland, the floats would be cut off and the pipe allowed to sink to the bottom of the trench. Once the pipe is settled in the trench, the trackhoe would traverse back across the wetland returning the spoil to the trench. The prefabricated equipment mats would then be retrieved from the wetland. Throughout the push-pull operation, silt fences/sediment curtains would be maintained as necessary to minimize sedimentation,

In its comments on the draft EIS, the WDOE stated that it would not likely permit trench spoil to be stored within Olson Lake or Evans Creek during construction of the crossings. Northwest estimates that 2,529 and 1,876 cubic yards (based on 3 feet of cover) of spoil would be excavated from the trenchlines of the Olson Lake and Evans Creek crossings, respectively. Hauling this amount of material out of and back into the wetland would significantly increase heavy equipment traffic within the wetlands, which would increase potential impacts from compaction and sedimentation. Additionally, the heavy equipment traffic would create a pumping action from the movement in and out of the wetlands that would push sediment out and away from the construction right-of-way and pump groundwater to the surface. Although the silt fences/sediment curtains would be installed on both sides of the construction right-of-way, it is expected that the excess pumping action would force saturated sediments away from the right-of-way and likely cause breaching of the silt fences/sediment curtains.

Furthermore, hauling the trench spoil out of the wetlands would not be practical or feasible because of the saturated condition of the spoil. Even if this spoil material could be hauled out of the wetlands, the impacts associated with its removal would exceed the proposed push-pull crossing procedure. In addition, the workspaces proposed for the crossings are not sized to accommodate the large volume of spoil that would need to be stored outside the wetlands and there are several constraints associated with obtaining additional workspace adjacent to the wetlands.

The workspaces on the north end of Olson Lake, would need to be expanded significantly to store the trench spoil. Northwest currently plans to eliminate or reduce the size of one of the workspaces because the landowner is building a home immediately adjacent to the construction right-of-way and the workspace encumbers the lot and would remove significant tree screens. Therefore, if the spoil is required to be removed from the wetland, the spoil would need to be hauled farther down the right-of-way. Enlargement of the workspace would increase impacts on adjacent forested wetland buffers.

The workspace on the south end of Olson Lake has recently been reduced in size during negotiations with the landowner to minimize impact on residential tree screens. Hauling the spoil out of the wetland would require that this workspace be enlarged, which would conflict with the landowner's request. Northwest states that enlargement of these workspaces would likely require condemnation.

At the Evans Creek crossing, the steep slope on the north side of the creek exceeds 30 percent and prevents hauling spoil out of the wetland to the north. Hauling the spoil out of the wetland to the south side would require the workspace on the south side of Evans Creek to be significantly increased in size. This increase in workspace would encompass the entire residential lawn area surrounding the adjacent residences. Northwest states that enlargement of this workspace would likely require condemnation.

Because hauling the spoil out of the wetlands would significantly increase heavy equipment traffic within the wetlands, would not be feasible because of the saturated conditions of the spoil, and would result in additional impacts on adjacent landowners, the FERC staff believes Northwest's proposal to store the spoil within the wetlands would be environmentally preferable.

In its comments on the draft EIS, the WDFW expressed concerns about the impact of a push-pull crossing of Olson Lake and Evans Creek on aquatic resources due to low dissolved oxygen and the potential for fish kills downstream. The WDOE and the WDFW have also commented that they consider an HDD crossing of Olson Lake to be a viable option. Additional details of the crossings of Olson Lake and Evans Creek are presented in sections 4.4.3 and 4.6.2.4.

Residential Areas

Northwest's proposed construction work area (i.e., construction right-of-way and extra work areas) would be located within 50 feet of 222 residences and 23 other structures, including shops, barns, garages, trailers, a batting cage, and commercial buildings. Of the 245 residences and structures, 125 are located on the Snohomish Loop, 67 are located on the Fort Lewis Loop, 28 are located on the Mount Vernon Loop, and 25 are located on the Sumas Loop. Northwest has prepared site-specific residential construction mitigation plans that detail the specific measures that would be used when construction occurs near residences. The locations of these residences and the plans are discussed in detail in section 4.8.3.

In general, Northwest would reduce the pipeline offset or the width of the construction right-of-way where feasible to minimize impacts on residences. Because of the limited amount of workspace along the Snohomish Loop, Northwest would replace the existing 26-inch-diameter pipeline with the proposed 36-inch-diameter pipeline in the same trench along the entire loop. Northwest would notify landowners or tenants living in the houses before construction. During construction, the edge of the construction work area within 50 feet of a residence would be fenced. The fencing would extend 100 feet on either side of the residence and would be maintained throughout at least the trenching phase of construction. Mature trees and landscaping would be preserved to the extent possible while ensuring the safe operation of construction equipment. Northwest would maintain access to homes, particularly for emergency vehicles. Standard working hours would be Monday through Saturday from 7:00 AM to 7:00 PM and would comply with local noise ordinances. Litter and debris would be removed daily from the construction right-of-way and dust generated by construction activities would be controlled by watering of the disturbed area.

Following completion of major construction, the property would be restored as requested by the landowner provided it does not interfere with the easement rights granted to Northwest for construction and operation of the pipeline system and is compatible with existing regulations. Compensation for longer-term impacts would be negotiated between Northwest and the individual landowner. Northwest has established a Landowner Complaint Resolution Procedure that would be implemented to resolve problems or issues raised by landowners during construction (see section 2.5).

Several comments were received during the scoping process regarding impacts on residences in the Sammamish area crossed by the Snohomish Loop, in particular from residents in the Deer Park Subdivision. The developers in this neighborhood placed homes immediately adjacent to the right-of-way and the backyards extend into the easement in several locations. As a result, several homes are located within 50 feet of the construction work area and several fences and retaining walls would have to be temporarily removed during pipeline construction. Northwest has developed a site-specific Residential Area Work Plan for the Deer Park Subdivision. The additional mitigation measures identified in the Residential Area Work Plan for the Deer Park Subdivision include:

- constructing in sections throughout the neighborhood to minimize the construction time near any individual home;
- installing safety fencing that consists of 6-foot-high chain link sections on the edges of both sides of the construction right-of-way to create a continuous boundary that separates the work area from the homes. The fence would also serve as temporary fencing to replace any fences that would be removed for construction. The fence would be secure to keep children and pets out of the work corridor and all construction activities would be contained within the fencing; and
- posting a security guard within the work area during non-working hours.

Several comments were received from residents within the Saddleback Subdivision on the Snohomish Loop regarding impacts on the subdivision associated with Northwest’s proposed temporary extra workspaces, access road, and expanded aboveground facility site at the southern end of the Snohomish Loop. Residents expressed concern regarding the impact of Northwest’s proposed facilities on a water well and associated water lines and damage to the subdivision’s access road. Residents also expressed concern about the loss of trees, increased traffic, and increased safety hazards in the area during construction. One landowner also expressed concern about impacts on a business located on his property (Premier Gentle Care). Northwest has prepared a draft Residential Area Work Plan for the Saddleback Subdivision similar to the one prepared for the Deer Park Subdivision.

Comments were also received from landowners within the Lake of the Woods Subdivision on the Snohomish Loop regarding impacts on a septic system and associated drain field as well as landscaping. A Residential Area Work Plan for the portion of the Lake of the Woods Subdivision between MPs 1389.4 and 1389.6 would be developed to minimize impacts on this area.

Additional details of these plans and Northwest’s proposed construction and mitigation measures for these areas are discussed in section 4.8.3.1. Alternatives to avoid the use of the proposed temporary extra workspaces, access road, and expanded aboveground facility site in the Saddleback Subdivision are also discussed in section 4.8.3.1. A discussion of alternatives to minimize impacts on the Lake of the Woods Subdivision is also included in section 4.8.3.1. Alternatives to avoid crossing the Deer Park, Saddleback, and Lake of the Woods Subdivisions are discussed in sections 3.2.2.2 and 3.5.

Agricultural Areas

Agricultural areas crossed by the project are identified in section 4.8.1. Northwest would conserve topsoil in all actively cultivated and rotated croplands, pastures, and hayfields. Northwest proposes to segregate a maximum of 12 inches of topsoil from over the trench in those areas and in other areas at the specific request of the landowner or land management agency. Where topsoil is less than 12 inches deep, the actual depth of the topsoil layer would be removed and segregated. The topsoil would be stored in separate windrows on the construction right-of-way. To ensure safety and integrity of the existing pipelines and to minimize the need for additional construction right-of-way width, Northwest proposes to spread the trench spoil over the existing pipelines for padding on the working side of the construction right-of-way. Use of the trenchline-only topsoil segregation method is discussed in detail in section 4.2.2. The depth of the trench would vary with the stability of the soil, but in all cases it would be sufficiently deep to allow for at least 3 feet of cover over the pipe.

Blasting

Northwest's evaluation of soils information indicates there is no hard bedrock within expected trench depths. Therefore, no blasting is anticipated for the Capacity Replacement Project. However, in the event that unrippable rock is encountered, blasting for trench excavation may be necessary. In those areas, care would be taken to prevent damage to underground structures (e.g., cables, conduits, and pipelines) and to springs, water wells, or other water sources. Blasting mats or soil cover would be used as necessary to prevent the scattering of loose rock. All blasting would be conducted during daylight hours and in accordance with applicable federal, state, and local codes and ordinances. Northwest would develop a detailed Blasting Plan in accordance with applicable DOT and OSHA requirements. The Blasting Plan would include, among other things, the use of blasting mats or soil cover to prevent the scattering of loose rock, measures to prevent accidental detonations (e.g., Detcord or similar method), all necessary permits and authorizations, notification of nearby building owners, and seismic monitoring of the blasts to ensure vibration limits are not exceeded.

Commercial and Industrial Areas

Commercial and industrial areas crossed by the project are identified in section 4.8.1. Impacts on commercial and industrial areas would be minimized by coordinating with business owners to maintain access, decrease construction duration, and generally minimize impacts during periods when construction activities may inconvenience business owners, employees, and customers.

2.3.3 Aboveground Facility Construction Procedures

The aboveground facilities would be constructed in accordance with Northwest's construction standards and would follow industry-accepted practices and procedures. Construction activities and storage of construction materials and equipment would be confined within the compressor station sites. At the Chehalis Compressor Station, a laydown area adjacent to the station would also be used. Debris and wastes generated from the construction and abandonment of existing facilities would be disposed of appropriately, and all disturbed surface areas would be restored. No special construction methods would be required for the proposed station modifications. Typical construction activities associated with compressor installation are summarized below.

Excavation would be performed as necessary to accommodate the reinforced concrete foundation for the new compressors. Forms would be set, rebar installed, and the concrete poured and cured in accordance with applicable standards. Concrete pours would be randomly sampled to verify compliance with minimum strength requirements. Backfill would be compacted in place, and excess soil would be used elsewhere or distributed around the site. If there is reason to believe the soil is contaminated, it would be tested and handled in accordance with a protocol developed in consultation with the WDOE prior to use on or off site (see section 4.3.1.2). The compression, piping, and other equipment would be shipped to the site by truck. The compressors would be offloaded using cranes. The equipment would then be positioned on the foundation, leveled, grouted, and secured with anchor bolts.

Welders and welding procedures would be qualified in accordance with API Standards or the ASME Boiler and Pressure Vessel code. Welds in large diameter gas piping systems would be X-rayed (or by use of other non-destructive testing methods) to ensure compliance with code requirements. All aboveground piping surfaces would be sandblasted and painted in accordance with Northwest's construction specifications. Paint inspection and cleanup would be conducted in accordance with regulatory requirements and best engineering practices.

In most cases, MLVs would be installed within the existing compressor stations, or at existing MLV settings. The installation of the MLVs and pig launchers and receivers would meet the same standards and requirements established for the compressor station modifications and pipeline construction. The MLVs and pig receivers that would not be collocated with existing aboveground facilities would be painted to blend with the surrounding landscape and slats of a compatible color would be added to the fencing around the facilities (see section 4.8.6).

After the completion of start-up and testing, or as soon as weather permits thereafter, the disturbed areas would be final graded and paved or graveled. Cleanup and restoration would be completed as work on an area is finished.

2.3.4 Abandoned Facilities Construction Procedures

Abandonment activities for facilities along the proposed loops would be conducted by the construction workforce for each loop using the standard pipeline construction procedures discussed above. The abandonment activities along the remainder of Northwest’s system would be completed by small, independent construction crews. The equipment of each of these crews would consist of a trackhoe, a welding rig, a crew cab, pick-up trucks, and some coating equipment. The width of disturbance would be limited to Northwest's existing right-of-way and long enough to accommodate equipment, personnel, materials, and spoil.

A trackhoe would be brought to each location by a lowboy trailer and offloaded. Welding rigs would also be driven to each location. Topsoil would be segregated where required to meet codes and permits. The tap valve from the 26-inch-diameter pipeline would be closed and the tap would be exposed. After the tap has been exposed, the lateral line that moves gas between the 26-inch-diameter pipeline and the meter station would be purged. Once purged, the lateral line would be unbolted from the tap valve and a blind flange would be bolted to the tap valve. A weld end cap would seal the lateral line. The valve, flange, and pipe would be recoated with a protective coating to prevent corrosion. The excavated area would then be backfilled, the topsoil replaced, and the disturbed area returned to original condition (e.g., fences, gravel) and reseeded with an approved seed mix.

The locations of the crossovers would be treated in the same way as the lateral isolations although the addition of stopple fittings may be necessary. Each location would be evaluated on a case-by-case basis to determine the valve location within the crossover. In situations where gas flow between the 26-inch- and the 30-inch-diameter pipelines cannot be isolated while still providing gas, a stopple fitting may be required. The stopple fitting would be installed to isolate gas from the crossover and provide a safe atmosphere for cutting the crossover into two pieces. The crossover would then be capped on the pipe side and a blind flange installed on the valve side. All other activities would occur as described above.

2.4 CONSTRUCTION SCHEDULE

Northwest has requested that HDD activities at three locations be authorized to begin in late 2005 if weather permits. Pipe, materials, and equipment for the remainder of the project would begin to be delivered in January 2006. Construction of the proposed loops, MLVs, and pig launchers and receivers is currently scheduled to begin around March 1, 2006. The loops would be constructed using four construction spreads and would take approximately 8 months to complete.

Modifications at the Chehalis Compressor Station are scheduled to begin in March 2006 and would take approximately 7 months to complete. The modifications at the Sumas, Mount Vernon, Snohomish, and Washougal Compressor Stations are scheduled to begin in May 2006 and would take approximately 3 months to complete at each location. The compressor station modifications would likely be conducted by a separate construction spread at each facility.

The abandonment activities are scheduled to begin in April 2006. The abandonment activities along the proposed loops would be completed by the construction spread for each loop. The abandonment activities along the remainder of Northwest's system would be completed by small, independent construction crews. Abandonment of the 26-inch-diameter facilities that are currently in service cannot be completed until the Capacity Replacement Project is placed in service; however, all abandonment activities would be completed on or before December 31, 2006.

The proposed facilities would be placed in service by November 1, 2006. After the proposed loops are in service and the abandonment activities are completed, the 26-inch-diameter pipeline would be isolated and filled with nitrogen.

2.5 ENVIRONMENTAL COMPLIANCE INSPECTION AND MITIGATION MONITORING

In preparing construction drawings and specifications for the project, Northwest would incorporate mitigation measures identified in its permit applications as well as additional requirements of federal, state, and local agencies. Northwest would provide the construction contractors with copies of applicable environmental permits as well as copies of "approved for construction" Environmental Construction Alignment Sheets and construction drawings and specifications.

Northwest would conduct training for its construction personnel regarding proper field implementation of the FERC staff's Plan and Procedures; the ECR Plan; and other project-specific plans, mitigation measures, and permit requirements. Construction personnel would also be instructed on the guidelines and standards adopted by other federal, state, and local regulatory agencies, some of which may be more stringent than the FERC requirements. Environmental training would be conducted before and during construction.

Northwest would be represented on each construction spread by a Chief Inspector, who would be responsible for quality assurance and compliance with mitigation measures, other applicable regulatory requirements, and company specifications. The Chief Inspector would be assisted by one or more Craft Inspector(s) and at least one full-time EI. The EI would be on site during active construction and would have peer status with all other activity inspectors. The EI would have authority to stop activities that violate the measures set forth in the project documents and authorizations and would have the authority to order corrective action. At a minimum, the EI would be responsible for:

- ensuring compliance with the measures set forth in the ECR Plan, the requirements of the FERC staff's Plan and Procedures, and all other environmental permits and approvals, as well as environmental requirements in landowner agreements;

- identifying, documenting, and overseeing corrective actions as necessary to bring an activity back into compliance;

- verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;

- verifying the location of signs and highly visible flagging marking the boundaries of sensitive resource areas, waterbodies, wetlands, or areas with special requirements along the construction work area;

- verifying the location of drainage and irrigation systems;

- determining whether wetland snags would be removed by construction activities, noting their locations, and determining the need and placement of snag replacement logs after construction;

- identifying erosion/sediment control and stabilization needs in all areas;

- locating dewatering structures and slope breakers to ensure they would not direct water into known cultural resource sites or locations of sensitive species;

- implementing a soil sampling protocol when contaminated soils are discovered, including conducting soil samples and preparing samples for laboratory analysis or being responsible for overseeing specialists to conduct the samples and prepare them for analysis;

- determining the adequacy of Northwest's proposed topsoil segregation method in wetlands;

- verifying that trench dewatering activities are located such that water is allowed to infiltrate whenever possible; turbid water does not reach a water of the state; and dewatering does not result in the deposition of sand, silt, and/or sediment. If such deposition is occurring, the EI would stop the dewatering activity and take corrective action to prevent reoccurrence;

- testing subsoil and topsoil in agricultural and residential areas to measure compaction and determine the need for corrective action;

- advising the Chief Inspector when conditions (such as wet weather) make it advisable to restrict construction activities to avoid excessive rutting;

- approving imported soils for use in agricultural and residential areas and verifying that the soil is certified free of noxious weeds and soil pests;

- determining the need for and ensuring that erosion controls are properly installed, as necessary, to prevent sediment flow into wetlands, waterbodies, sensitive areas, and onto roads. This would include evaluating erosion controls prior to a predicted storm event whenever possible and installing additional measures as needed to control stormwater and sediment;

- determining the need for and implementation of dust control measures;

- inspecting and ensuring the maintenance of temporary erosion control measures at least daily in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of each 0.5 inch or greater of rainfall. The inspections would be recorded and the records maintained for review upon request;

- ensuring restoration of contours and topsoil;
- determining the locations where slash or non-merchantable timber would be scattered across the right-of-way to be used for wildlife habitat;
- ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours after identification;
- keeping records of compliance with conditions of all environmental permits and approvals during active construction and restoration; and
- identifying areas that should be given special attention to ensure stabilization and restoration after the construction phase.

In addition, the EI would be responsible for notifying Northwest's Lead Environmental Specialist when permit violations occur and when permit requirements need to be altered due to field conditions. Northwest's Lead Environmental Specialist would notify the applicable agencies and negotiate any necessary changes. Northwest's Lead Environmental Specialist would provide an "Environmental Agency Complaint Line" to the agencies and would provide the credentials of the EIs to the appropriate state agencies

In its comments on the draft EIS, the WDOE recommended that the list of EI duties be expanded to also include responsibilities related to the handling of imported fill, identification and handling of arsenic-contaminated soil, and washing of equipment before entering waterbodies and traveling on public roadways. The WDOE also recommended that the EI's responsibility to ensure that ineffective temporary erosion control measures are repaired within 24 hours of discovery should be revised to ensure that repairs are made immediately if discharges of turbid water or other pollutants are occurring. In addition, the WDOE recommended that notification to agencies of construction activities, permit violations, and/or situations where permit requirements need to be altered due to field conditions should occur as soon as possible but no later than 4 hours after identification of the issue unless an alternative agreement with individual compliance agencies is adopted. The FERC staff believes the third-party compliance monitoring program to be implemented during construction (see below) would also be an appropriate mechanism to handle alternations of permit requirements.

In its comments on the draft EIS, the WDFW recommended that the determination of locations where slash or non-merchantable timber would be scattered across the right-of-way to be used for wildlife habitat as well as the quantities that would be scattered should be made in consultation with WDFW biologists. The FERC staff believes these determinations should also be made in consultation with landowners. In addition, the FERC staff notes that it prepared the above list of duties based on the responsibilities of the EI as listed in the ECR Plan as well as from statements regarding EI responsibilities that were included in other Northwest filings. Therefore, **the FERC staff recommends that:**

- **Northwest prepare a revised ECR Plan that includes the following tasks in the list of EI responsibilities:**

  a. **evaluating the source of any imported fill and ensuring that it meets the standards for clean fill as defined in the Solid Waste Handling Standards for Washington State, Chapter 173-350-100 of the WAC;**

b. identifying areas of arsenic contamination along the right-of-way and ensuring that arsenic-contaminated soils are handled in compliance with federal, state, and local safety and environmental regulations;

c. implementing guidelines to ensure that equipment is washed before entering waterbodies and traveling on public roadways and to ensure that roadways are swept at the end of the work day if necessary;

d. ensuring the repair of all ineffective temporary erosion control measures as soon as possible but not longer than 24 hours after identification and requiring the repairs to be completed immediately if discharges of turbid water or other pollutants are occurring; and

e. determining the locations where slash or non-merchantable timber would be scattered across the right-of-way to be used for wildlife habitat and the quantities that would be used in consultation with WDFW biologists and landowners.

The ECR Plan should also be revised to include all of the EI duties listed in this section and state that notification to agencies of construction activities, permit violations, and/or situations where permit requirements need to be altered due to field conditions should occur as soon as possible but no later than 4 hours after identification of the issue unless handled as a variance through the third-party compliance monitoring program or an alternative agreement with individual compliance agencies is adopted. Northwest should file the revised ECR Plan with the Secretary for the review and written approval of the Director of the Office of Energy Projects (OEP) before construction.[3]

The FERC staff's recommended mitigation measure number 6 (see section 5.4) requires Northwest to submit an Implementation Plan for approval prior to the commencement of construction. The Implementation Plan must identify the number of EIs assigned per spread and describe how Northwest will ensure that sufficient personnel are available to implement the environmental mitigation. When the FERC staff reviews the Implementation Plan, it will consider the number and qualifications of the EIs identified by Northwest and determine whether they are appropriate for this project. If the FERC staff finds that the environmental inspection plan is not sufficient, the Director of OEP may be advised to either require a change in the number of EIs or individual personnel.

In addition to Northwest's environmental inspection program, full-time third-party compliance monitors representing the FERC would be present on the construction spreads to monitor compliance with project mitigation measures and requirements. These requirements include the environmental mitigation measures that were proposed by Northwest throughout the permitting phase of the project and those additional measures that were included as stipulations of the FERC Certificate; the FWS and NOAA Fisheries Biological Opinions; and permits from other authorizing federal, state, and local agencies. During construction, the third-party compliance monitors would conduct daily ongoing inspections of construction activities and mitigation measures and provide regular feedback on compliance issues to the FERC, Northwest, and other applicable agencies. The FERC staff would also conduct periodic inspections of the project for compliance with the Commission's environmental

3 Once Northwest files the revised ECR Plan it will be available for viewing on the FERC Internet website (http://www.ferc.gov). Using the "eLibrary" link, select "General Search" from the eLibrary menu and enter the docket number excluding the last three digits in the "Docket Number" field (i.e., CP05-32). Be sure to select an appropriate date range.

conditions. Other federal, state, and local agencies would conduct oversight of inspection and monitoring to the extent determined necessary by the individual agency.

Northwest has developed a Landowner Complaint Resolution Procedure that would be implemented during construction of the Capacity Replacement Project. The components of Northwest's Landowner Complaint Resolution Procedure are described below.

- Before construction, Northwest would provide affected landowners and municipality offices with the telephone numbers and contact names for Northwest's local land representative(s), construction office(s), and a project "hotline" to Northwest's office in Salt Lake City, Utah and the FERC's Enforcement Hotline.

- In the event that a complaint arises due to project activities, the public would first be instructed to call the land representatives as the first and primary means for initiating resolution of the issue. The land representatives would be available during construction and restoration activities from 7:00 AM to 5:00 PM Monday through Saturday.

- If the land representatives do not provide a timely and/or satisfactory response or contact is necessary outside of business hours, the public would be instructed to leave a message at the Project Land Office. The Project Land Office would be staffed from 7:00 AM to 5:30 PM and calls after hours would be forwarded to a company representative until 7:00 PM. The question/concern would be directed to the appropriate party. If the public leaves a message, a project representative would promptly return the call during the next business day to acknowledge receipt of the message and a response to the question/concern would be provided within 24 to 48 hours.

- If a satisfactory response/resolution to the question/concern is still not received, the public would be instructed to contact the Capacity Replacement Project Hotline. The hotline attendant would document each complaint received, including the date and time of the call; name, address, and telephone number of the caller; and a detailed description of the issue of concern. The hotline attendant would then determine the appropriate project personnel to address the issue and would designate responsibility to that person to resolve the issue. A response to the call could be expected within 24 to 48 hours.

- The responsible project personnel would investigate the issue and either resolve the issue or recontact the landowner/caller within 48 hours to further coordinate an acceptable solution. Following resolution of the issue, the responsible project personnel would contact the hotline attendant to "close out" the issue for the record, noting the date and means of resolution. All complaints received, and the status of their resolution would be documented in a biweekly status report that would be submitted to the FERC.

- Northwest's goal is to resolve all complaints within 24 to 48 hours of receiving them. However, Northwest acknowledges that some issues would require more than 48 hours to resolve. In this event, Northwest recognizes that keeping the landowner informed of the progress and schedule for resolution is critical to maintaining good faith and satisfaction of the landowners.

- The hotline attendant would closely track the progress of each issue with the assigned responsible project personnel and would provide assistance and/or would facilitate resolution as needed during the process.

- Finally, if satisfactory response to the question/concern is still not received, the public would be provided with the FERC's Enforcement Hotline and instructed to provide FERC with the project number.

The FERC staff believes Northwest's Landowner Complaint Resolution Procedure adequately outlines procedures for landowners to contact a Northwest representative during construction and specifies an appropriate response time for Northwest to address landowner issues**.**

2.6 OPERATION, MAINTENANCE, AND SAFETY CONTROLS

Northwest would operate and maintain the proposed pipeline and aboveground facilities in compliance with DOT regulations provided in Title 49 CFR Part 192, the Commission's guidance at Title 18 CFR Part 380.15, and the maintenance provisions of the FERC staff's Plan and Procedures. No new permanent employees would be added to operate and maintain the new pipeline and aboveground facilities. Personnel from Northwest's existing staff would be available to assume operation and maintenance of the facilities as part of their routine workload.

Maintenance activities would include regularly scheduled gas-leak surveys and measures necessary to repair any potential leaks. All valves would be periodically inspected and greased. Vegetation on the permanent right-of-way would be maintained by mowing, cutting, and trimming. The FERC staff's Procedures includes limitations on vegetation maintenance in wetland and riparian areas and at stream crossings to allow the restoration of native wetland and riparian species, including woody species, over a greater portion of the right-of-way than would be typically allowed in upland areas (see sections 4.3.2.2, 4.4.2, and 4.5.3). The right-of-way would be allowed to revegetate; however, trees greater than 15 feet in height within 15 feet of the pipeline centerline would be periodically removed. The frequency of vegetation maintenance would depend upon the vegetation growth rate. Vegetation maintenance would not normally be required in agricultural or pasture areas.

The pipeline facilities would be clearly marked at line-of-sight intervals and at crossings of roads, railroads, and other key points. The markers would indicate the presence of the pipeline and provide a telephone number and address where a company representative could be reached in the event of an emergency or before any excavation in the area of the pipeline by a third party. Northwest participates in all "One-Call" programs. "One-Call" programs are used by public utilities and some private sector companies to provide information on the location of underground pipes, cables, and culverts.

Periodic aerial and ground inspections by pipeline personnel would identify soil erosion that may expose the pipe; dead vegetation that may indicate a leak in the line; conditions of the vegetative cover and erosion control measures; unauthorized encroachment on the right-of-way, such as building and other substantial structures; and other conditions that could present a safety hazard or require preventive maintenance or repairs. The pipeline cathodic protection system would also be monitored and inspected periodically to ensure proper and adequate corrosion protection. Northwest would evaluate the existing cathodic protection system and design and install additional cathodic protection as required. A survey would then be performed to determine if adequate protection has been achieved and modifications to the cathodic protection system would be made accordingly.

Compressor station crews would perform operation and maintenance of the new and existing equipment. Station personnel would perform routine checks of the facilities including calibration of equipment and instrumentation, inspection of critical components, and scheduled and routine maintenance of equipment. Safety equipment, such as pressure relief devices, fire detection and suppression systems, and gas detection systems would be tested for proper operation. Corrective actions would be taken for any identified problem. Northwest would be required to submit maintenance records and report any malfunction or emergency to the WDOE.

Controls and safety devices would be a combination of electronic, pneumatic, and mechanical. The safety system would be designed to protect the equipment, personnel, and surrounding area from a dangerous situation. The existing stations are equipped with combustible gas and fire detection alarm systems and an emergency shutdown system, all of which would be expanded to include the new equipment. The gas detection system would sound an alarm upon detection of 25 percent of the lower explosive limit of natural gas in air. Automatic emergency shutdown of the compressors, evacuation or venting of gas from the station piping, and isolation of the station from the pipelines would occur following a fire detection alarm or the detection of a 50 percent lower explosive limit inside the station. The compressor stations are also equipped with relief valves or pressure protection devices to protect the station piping from overpressure if station or unit control systems failed. A telemetry system would notify personnel locally and at the gas control headquarters in Salt Lake City of the activation of safety systems and alarms, who would in turn instruct maintenance personnel to investigate and take proper corrective actions.

2.7 FUTURE PLANS AND ABANDONMENT

As discussed in section 1.1, the DOT has issued a CAO requiring Northwest to abandon the existing 26-inch-diameter pipeline because the pipeline is subject to stress corrosion cracking. Although technology does not currently exist that would allow the integrity of the pipeline to be demonstrated, new technology is being developed that can more accurately detect stress corrosion cracking. Northwest states that at some future date when the new technology becomes available, it hopes to utilize the new inspection tools to identify anomalies. Assuming that the anomalies could be identified and repaired and the integrity of the pipeline demonstrated, Northwest could possibly put the pipeline back in service if approved by the DOT. Northwest's proposal to leave as much of the pipeline intact as possible would allow it to be put back in service for future gas deliveries with minimal environmental impact and disruption to landowners.

Several comments were received about the potential future need for Northwest to replace the existing 30-inch-diameter pipeline. As technology continues to improve, the new inspection tools discussed above that could potentially allow Northwest to identify and repair anomalies on its 26-inch-diameter pipeline could also extend the life of the 30-inch-diameter pipeline. However, Northwest states that, although it is not anticipated, if the 30-inch-diameter pipeline were no longer viable for service and the 26-inch-diameter pipeline could not be returned to service, a continuous pipeline would have to be installed that could service all customers along the Sumas to Washougal corridor. One option would be to extend the existing 36-inch-diameter loops that were constructed as part of the Evergreen Expansion Project and the 36-inch-diameter loops proposed to be constructed as part of the Capacity Replacement Project into a continuous pipeline. This would involve the installation of approximately 160 miles of 36-inch-diameter pipeline. Preliminary hydraulic modeling shows that the capacity of a 36-inch-diameter pipeline running from Sumas to Washougal would roughly replace the current capacity of the existing pipeline system with some upgrades at existing compressor stations.

Northwest states that it has no definitive plans for either future expansion or abandonment of the new facilities proposed as part of the Capacity Replacement Project. Properly maintained, and assuming adequate gas supplies and markets, the proposed loops are expected to operate for 50 or more years. If and when Northwest abandons any of the proposed facilities, the abandonment would be subject to separate approvals by the FERC and other federal land management agencies. The FERC review would be conducted under section 7(b) of the NGA.